THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LVII. No. 1458.] LONDON, APRIL 21, 1891. [43RD YEAR. Price 6d.

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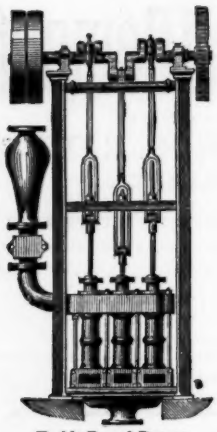

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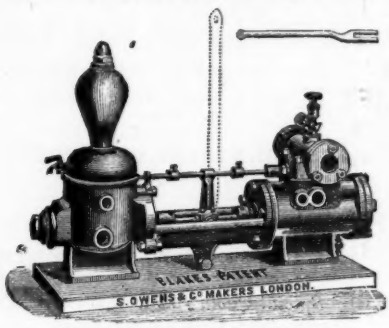

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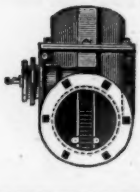

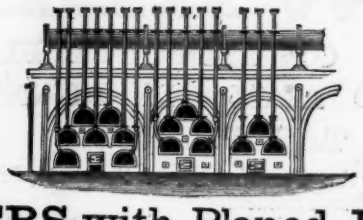

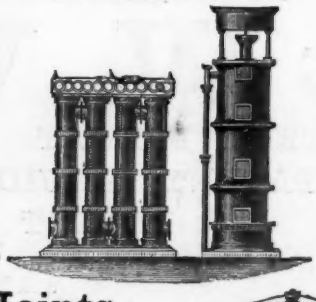

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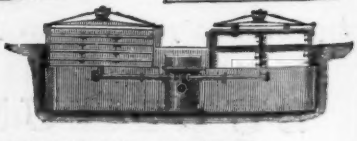

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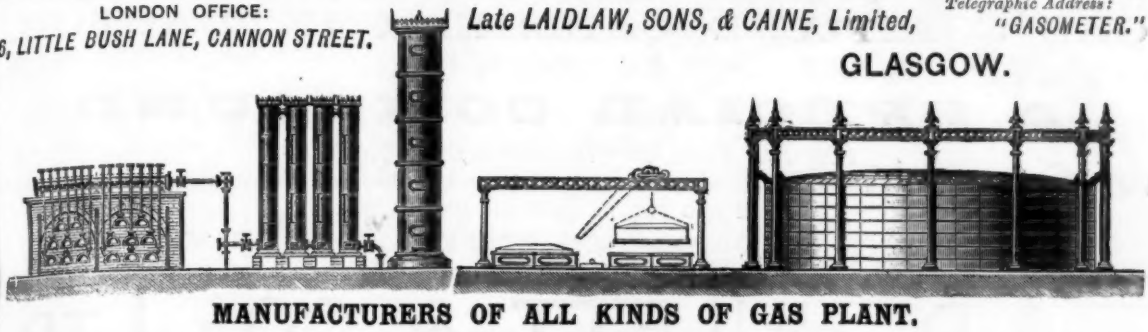

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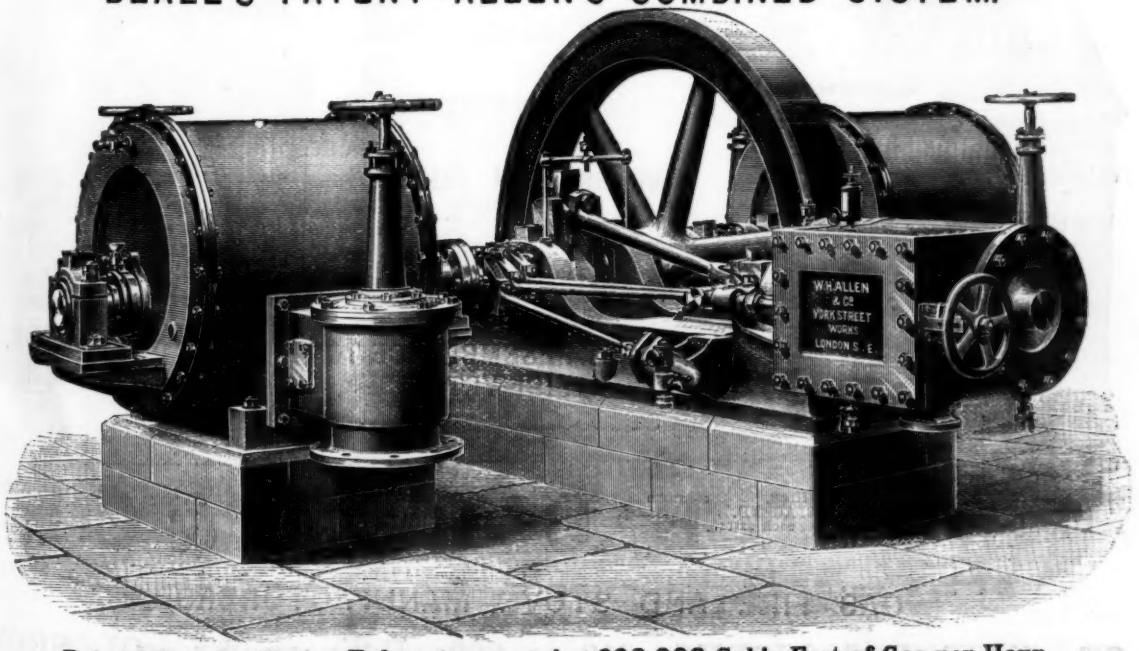

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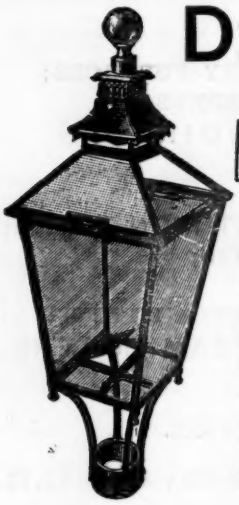

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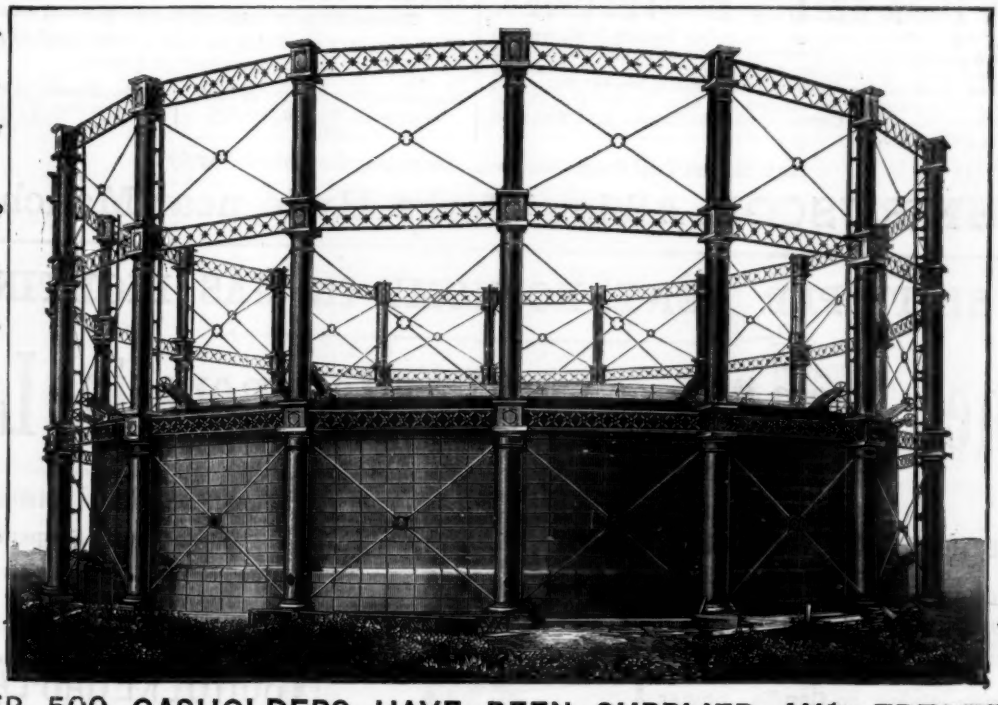

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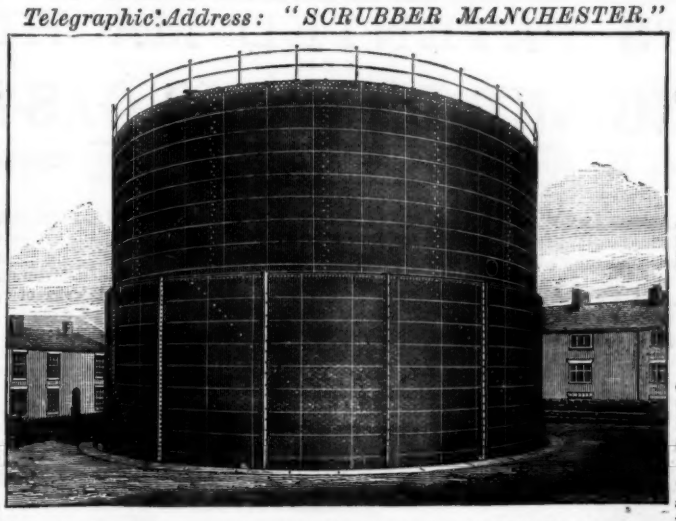

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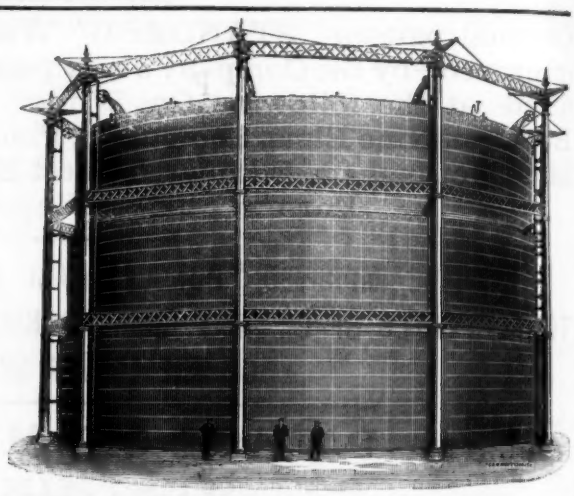

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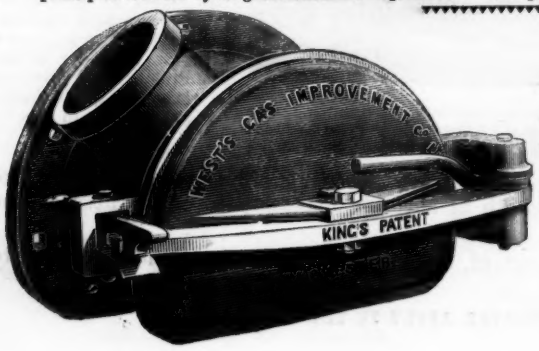

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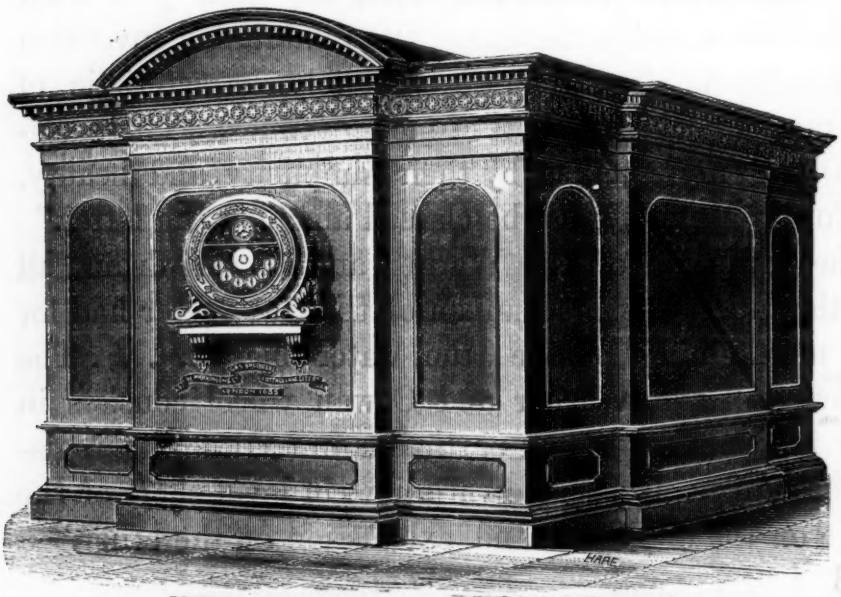

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, APRIL 21, 1891.

Inventions and Prizes.

IN our "Correspondence" columns to-day will be found a letter from Mr. W. A. Padfield, of Exeter, calling renewed attention to a suggestion he made when President of the South-Western Association of Gas Managers', that the energies of inventors might be stimulated in certain directions, and the production of certain novelties important to gas makers and users fostered, by the offer of prizes by a Syndicate of Gas Companies. Mr. Padfield as good as promises that the Company of which he is the official representative will help, if his suggestion should be more favourably received now than it was when first made, to create a prize-fund worthy of the objects in view and the interests to be served. It is quite possible to sympathize with such a motive as that which has stirred Mr. Padfield in regard to this matter, and to give the proposer every credit for the best intentions and no little reason, while at the same time to hold the opinion—formed from a deliberate survey of the history of mechanical inventions—that the suggestion itself is likely to be futile. Some sense of this fact must have been borne in upon Mr. Padfield's mind by his perception of the circumstance that his proposal fell flat at the time it was made, and has never received support since. It is clear that this neglect must have some explanation; and the interpretation we give of it is the existence of a vague but very real impression among gas engineers, that no special prize is needed to stimulate efforts to produce merchantable inventions. This is not the way to obtain valid inventions, which are the most difficult things in the world to raise to order. Perhaps, therefore, it will not be altogether a waste of time if we consider in a general way some reflections arising on such a suggestion as that put forward by Mr. Padfield.

It is evident from the most cursory survey of the history and current course of invention, that by far the greater number of really useful and novel inventions have come upon the world as surprises—not always welcome—due to individual initiative. Indeed, it is of the essence of a real invention that it shall be spontaneous—the thought as well as the device of the inventor. When the world can say to a man "This is what is wanted; provide it," half the meaning of the word invention is taken away from whatever may be forthcoming by way of response to the invitation. The true and original inventor is the man who says to the world which had previously no perception of the fact, "Here is something that is wanted; take it from me." The supply creates the demand in this case. It is true that, upon rare occasions, invention has been successfully stimulated to deal with definite requirements; but this has been almost invariably when some out-of-the-way object has been suggested by a Government, or other non-commercial organization, and a prize has been offered in lieu of that commercial reward which was not to be looked for in connection with the subject matter. The most striking and familiar illustration of the success of a Government prize in stimulating invention is that of Harrison's improvements of the marine chronometer. Another is the means for mechanically treating rhea for the production of fibre. The few successes that can be recalled to mind as examples of inventions made to order sink into insignificance, however, beside the vast number and importance of the recognized wants that no invention succeeds in supplying, although immortal renown and boundless wealth await the conquering genius.

As a clever man once remarked, "plenty of little gold "medals" are always ready for whoever solves problems of Nature and contributes to satisfy the wants of every-day life; but it is hardly possible to take up a technical journal without coming across some confession of want that never seems likely to be satisfied. In a recent issue of a periodical that specially cultivates the worship of inventors and inventions, we stumbled upon two suggestions of "fields for inventive genius" in two following pages. Indeed, if we could piece all these "fields" together as fast as they are marked out for occupation, they would make such a large territory that the settled and occupied regions which inventors might be permitted to take no care for, would appear insignificantly small in comparison. If we even fall back upon Mr. Padfield's modest pair of wants—complete sulphur purification, and a thoroughly good domestic burner (whatever this means)—it is open to anybody to urge that there are plenty of more pressing wants in the range of gas manufacture and utilization. What about the hot-cylinder gas-engine, the economical gas-fire, the perfectly unobjectionable gas kitchener, the complete ventilation of gas-lighted rooms—to mention only a very few gas consumers' *desiderata*? And as to complete sulphur purification, it is by no means certain that a

process to this end would be hailed by gas managers as necessarily an unmixed blessing. Seeing that sulphur purification to the extent to which it is even now practicable, is a luxury that local authorities are far more inclined to demand than to pay for, we can even conceive that the wise man who should hit upon a possible but perhaps troublesome and almost, certainly costly process for perfecting the operation, might manage to raise more money from a Syndicate of Gas Companies by engaging to say nothing at all about it, than by rashly bringing it into light.

On the whole, therefore, we are persuaded that inventors, whether of gas processes or apparatus, or anything else, are best left severely alone, to work out their devices for such reward as they may secure in the market. There is no harm in saying at large that "such-a-thing is "wanted;" for, as has already been admitted, inventions to order are not absolutely unknown. They are likely to be best, however, when they come of their own accord. Moreover, Mr. Padfield must have read recent history somewhat imperfectly if he has missed the record of the troubles, heartburnings, and indescribable worries that have attended past attempts to adjudicate between rival makers of gas-burners. If he has not quite ignored this unpleasant object-lesson in the frailty of human nature, and the peculiarly exasperating character of the gas-burner business, he must be indeed a bold man to contemplate unmoved the responsibilities which such a Syndicate as he has imagined would be likely to bring upon themselves from the moment they undertook to do anything useful. Mr. Padfield's worst enemies could not wish him a more dreadful fate than to be chosen to preside over his suggested Syndicate, and to bear the brunt of the old and new animosities it would certainly awaken and create.

Labour Topics.

THE lesson of New Unionism has been taught at large in several different places during the last few days. The strikers from Spratt's biscuit factory, having "stood out "nobly" upon the invitation of the Social Democratic agitators who are paid for their job, were so disgusted at the prospect of other men taking their rejected places, that some of the more ebullient took to remonstrating with the latter by the strong, if inconclusive, argument of brickbats. The Police Magistrates have commented upon these proceedings in their usual unsympathetic fashion; but the sufferers being only of the rank and file, there are no such "movements" for their release as have been engineered in favour of the "martyr" Wilson. Rioting has gone on in Bradford for days; the mischievous efforts of the imported agitator being credited with having turned the obstinate, but previously peaceable, dispute between the silk weavers and their employers into a general upheaval of all the ruffianism of the town against the cause of civilization and order. It is the most mournful aspect of what is put forward as Labour Politics at the present juncture, that those who have set themselves up as spokesmen for the day workers are unable to think of anything else but striking—first in the conventional, and afterwards, if they do not get their own way, in the literal sense. Mr. Michael Davitt, who, with all the bees he has in his bonnet, is far and away the most philosophical spokesman of the stock Mass Meeting company, has endeavoured to turn the minds of his followers from the too exclusive contemplation of strikes; but with no other apparent effect than the weakening of his own position. The Union as a means of striking, and striking in order to justify the Union—these are the only themes that the orthodox Labour Agitator cares to think or talk about. It is a miserable delusion, as those who do not make money by the business are finding out day by day. Why, the Unions that talk so big, and whose leaders try so hard to persuade the newspapers and the public that all non-Unionists are the scum of the earth, do not comprise within their membership one in ten of the working population of the country. Nor will they improve their position, until they shake off the domination of the strike-maniacs. There are vast numbers of wage-earners who, by the nature of their occupation, their isolation, and for fifty other reasons, can never strike. To tie every possible amelioration of the workers to strikes, is consequently to deprive the majority of the order of all chance of improving their lot. Strikes are an effective weapon in proper time and place; but how many of the self-appointed leaders of the New Trades Unionism can claim reliable knowledge of these times and places? Does John Burns know them, or Tillett, or Quelch, or Wilson, or Thorne? All these people, we may take it, hope to secure the advertisement of an appearance before the Labour Commission. They may be advised to prepare themselves by committing to writing true and succinct accounts, among other matters relating to their occupation, of all the strikes and lock-outs with which they have been connected—giving the origin, circumstances, and results. It will be surprising if some of these wire-pullers can claim one success to ten failures. Most of them have been completely successful as manufacturers of what they are pleased to call "black-legs;" because the defeated strikers at one place are certain to turn up as free hands at the next. If their Unions will not support them, what are men to do? A leader who makes a mess of one strike ought not to be permitted to have anything to do with another; but if this rule were adhered to, a fresh batch of agitators would have to be raised every week. By the way, it is rather a pity that the latest new "organ" of the Cause of Labour, the *Trade Unionist*, should have fallen in its third number into the error that the Cause can be helped by disregarding the Ninth Commandment, which it does by interpolating the name of John Burns into a professed extract from a leading article which appeared in our issue for the 7th inst. We are no admirers of Mr. John Burns; but we did *not* include his name in the passage in question, which commences in the ninth line of the second column on p. 636. We were obviously referring to the last subject mentioned—the "London loafer;" and to misrepresent us as the *Trade Unionist* does in this connection, is more than unfair, it is silly and weak in the extreme. The conductors of this new publication will serve their supposed clients better by paying attention to what actually does appear in these columns than by printing garbled extracts from them.

The Gas Workers' Union have been trying to make out that there is dissatisfaction among the South Metropolitan stokers with regard to the reversion from three shifts to two, with corresponding increase of pay, in some of the retort-houses belonging to this Company. It is easy enough for the Union leaders to make assertions to this effect at open-air meetings and to ingenuous reporters for the daily newspapers, who are under no obligation to test the truth of such statements by inquiry of the men interested in the matter. These latter naturally do not trouble themselves to correct the misstatements which their professional enemies continually circulate respecting their views and conduct. It is a pet delusion of Messrs. Thorne, Ward, and Co. that there is not a workman on the South Metropolitan establishment who knows his business, or is contented with his employment; and a marvellous amount of ingenuity and effrontery is displayed in the invention and promulgation of fables in support of this hypothesis. There never was a more impudent and baseless fabrication, however, even by these experienced counterfeiters of South Metropolitan intelligence, than this latest report about the attitude of the men employed at East Greenwich and Kent Road respecting the alteration of the shifts. We are enabled to state that the change was made by the express desire of the men affected, or of the great majority of them. It had been in contemplation to let matters go on as they were until next lighting-up season, when any men who liked would have had the chance of engaging for two shifts at the advanced rate of pay. The men who are now retained as the permanent summer staff, however, for several of the retort-houses (all, we believe, machine stoked) hitherto worked on the three-shift system, desired to have the advantage of the increased pay for the summer; and so the change has been expedited by several months. The men themselves contend that they are worse off under the three-shift system than with two shifts, inasmuch as when they turn out of the works at two o'clock in the day, after working from six in the morning, they cannot sit at home all the hours until bedtime, and are therefore driven to walk about the streets, which means spending money. Under the altered system, the last draw of the day shift is at four o'clock; and every man can be out of the works, if he likes, half an hour later. He has, moreover, an hour for breakfast and another for dinner. It is therefore a misnomer to call this 12 hours' work, seeing that the men need be on the premises for only 9½ hours, of which but 5 are spent in stoking. If this is "slavery," it is a condition

that few able-bodied workers would object to experience at the price. The truth is that the irritation of the Gas Workers' Union against the system has no reference to the wishes of the men who work, but arises wholly from the Social-Democratic politicians who are bent upon capturing the labour vote by the bait of the Eight-Hour Movement. It is a check to these demagogues whenever any system of day work to which the term "Eight Hours" can be applied is rejected by those whom the movement for fixing this limit to the working day is supposed to benefit. Hence these lies and lamentations in the Union camp over "Livesey's latest."

When does Coal mean Coke also?

THE curious appeal case of *Fletcher v. Fields*, of which a special report appears in another column, is a remarkable exemplification of the difficulties that attend the interpretation of an apparently plain statutory enactment. Last November, as we reported at the time, a Metropolitan Police Magistrate convicted The Gaslight and Coke Company, under section 15 of the Metropolitan Streets Act, 1867, for unloading a quantity of coke on the pavement of Victoria Street, Westminster, between the hours of ten and six in the daytime, during which period, according to the terms of the Act, no "coal" may be put upon the public footway. The contention of the prosecution was that, for the purpose of the Act, the word "coal" must be held to comprise coke. This the defendants denied; arguing that if Parliament had meant to legislate for coke as well as coal, this would have been stated. The Magistrate took the former view, on the broad ground that the object of the Act was to keep the footways clear, and that it would be absurd to forbid coal to be taken into premises during hours when coke might be had in despite of the policeman. Mr. Sheil said, in short, having regard to the object sought to be attained by the Act, "coke is coal." Now, this is precisely the kind of judgment a Police Magistrate, who dispenses justice very much after the style of the Eastern Cadi of the story-books, would be likely to pronounce. The purpose of the Act was not to discriminate between varieties of fuel intended for domestic use, but to keep street footways clear; *ergo*, there is absolutely no difference in this connection between coke and coal. Many people, we suspect, would hold that the Magistrate took the common-sense view of the question. However, the appeal went up to the serene heights where the Judges of the Queen's Bench Division define the law in all its purity, without reference to practical considerations; and—equally as might be expected—the Court reversed the decision of the Magistrate, and declined to stretch the word of the Act so as to make coal include coke. If the appeal were to go farther, the alternative view might again prevail. This is, indeed, one of those nice points of definition with regard to which the opinion on one side sounds perfectly good until the other side is heard. "If the Legislature had "meant coke, it would have said so," says one. "So it "did," is the reply; "for it employed the word 'coal' in "the general sense." It is a case in which dictionaries were arrayed against law-books; and although victory remains with the latter, it would not be prudent to say that the former are utterly defeated. The *dicta* of the Judges were both strong and weak. Mr. Justice A. L. Smith succeeded in posing Counsel for the respondents by asking whether he could make the word under discussion include cinders as well as coke. The answer was in the negative —which was tantamount to yielding the point, because, as the learned Judge triumphantly demanded, what sort of construing of an Act of Parliament would it be that should read "coal" to mean also "coke," because coke is a product of coal which is likewise used as fuel, while refusing to make it read "cinders," to which the same description applies? Mr. Justice Grantham, while strong on the principle that an enactment restricting the liberty of the subject must not be stretched farther than it is obviously intended to be, became very feeble when he remarked that coke "is "not an article which is in common use for domestic pur-"poses; and consequently it was not thought necessary to "legislate against it." What does his Lordship's cook burn in the kitchener of his Lordship's town residence, to say nothing of his country house? Manifestly, here is an opportunity for a coke agent of The Gaslight and Coke Company to secure a new customer. It is to be hoped, however, that if an order for coke from Sir W. Grantham is ever booked by the Company, their servants will not be so inconsiderate as to deliver the load in St. George's Square, S.W., between the hours of ten and six, or if they do, that it will not be on an afternoon while Lady Grantham is "receiving." Otherwise, his Lordship might be induced to supplement his own reading of the Act with an earnest hope for its speedy amendment. Jesting apart, the Company, being strong, may be trusted to show mercy, and not to spoil their coke sales by pushing to the extreme a right which, if exercised at some times and places, would be a decided nuisance.

A Legal Inconsistency.

IF those who profess to champion the cause of Labour would only think less about strikes and their own personal interests, and more of other points of workmen's politics besides wages and hours of work, they might find many opportunities for doing good service, not only to the class of wage-earners, but also to the community at large. For example, a decision was recently given by Justice Stephen which possesses the gravest interest for all factory workers; but not the slightest notice has been taken of it, so far as we have seen, by any public journal besides the *Builder*, which is as much an organ of "capital" as the JOURNAL. It was a case of a worker in a chemical factory, who had unquestionably suffered severely in health from the fumes of the chemicals employed in a waterproofing process upon which he was engaged. He brought an action for damages against his employers, and submitted evidence at the trial to prove that the machine at which he had worked was inefficient and imperfect as compared with plant used for the same purpose by other firms in the trade, which were designed to obviate the injuries of which he was a victim. These facts were apparently established; but the plaintiff was non-suited, because, as the Judge said, there is no legal obligation on any manufacturer to use the best machinery in his business. It was admitted to be a hard case for the plaintiff; but there was no remedy for him. Now, here is a matter in which it would seem that employers of every grade have a common cause. A clerk suffers in his eyesight because the office in which he is appointed to work is miserably lighted—no matter, the employer is not bound to bear the damage. One machine is more dangerous in use than another—so long as it is good enough for the owner, it must serve for the attendant, though it imperil his life and limbs. We are certainly under the impression that this doctrine does not hold good for the proprietor as against the public; and that a factory-owner or any other tradesman is bound to carry on his business in the most efficient way known, with a view to the interest of public safety and the avoidance of nuisance. Why, then, should the employee be less protected as against his own employer than he is, as one of the public, against the employer of others? This is one of those niceties of the law which the lay mind finds most difficult to understand. At present it would appear as if a Gas Company, for example, must use the very best sulphate plant if they would escape indictment for negligently creating a nuisance to A.B., a ratepayer of the district; but if A.B. is working in the same factory for wages, he must put up with it if the plant, being old fashioned, half poisons him. Can this truly be good law? If so, it is certainly queer justice.

The Inflammable Liquids Bill, on the provisions of which some comments were made in the JOURNAL for the 31st ult., was withdrawn by the Government on Monday last week. Reference has been already made to the opposition to the measure; and its extent may be appreciated by the fact that no less than 52 notices of motion for its rejection stood on the paper of the House of Commons on the above-named day, when the Bill was down for second reading.

Lighthouse Illuminants.—At a meeting of the Royal Dublin Society last Wednesday, Mr. J. R. Wigham exhibited in action a new lighthouse burner which he has invented, and which he proved, by photometric experiment conducted upon the spot, possesses twice the illuminating power of the largest burners at present used in lighthouses. It is calculated that this burner, in connection with a new system of lenses also devised and described by Mr. Wigham, will transmit to the mariner, when required in thick weather, a light equal to about 8,000,000 candles, which far exceeds in intensity that of the most powerful lighthouse light in the world.

WATER AND SANITARY AFFAIRS.

THE Select Committee of the House of Commons, appointed to consider the question of the London Water Supply, have held their preliminary meeting, and have elected Sir Matthew White Ridley as their Chairman. We anticipated the choice of the Committee as to their Chairman, but we certainly did not expect that they would take, as the basis of their inquiry, a paragraph to be found in the report of Sir William Harcourt's Committee which sat in 1880, when the Purchase Bill of the present Viscount Cross was under consideration. The instruction conveyed to the present Committee by the House of Commons, on the motion of Mr. Ritchie, was that they had power "to inquire into all matters connected with "the nature, price, management, sources, and sufficiency "of the water supply of London and its suburbs." Virtually, this was giving the Committee *carte blanche*. Instead of exercising these plenary powers of investigation, the Committee have resolved to accept, as an established principle—"That it is expedient that the supply of water "to the Metropolis should be placed under the control "of some public body which shall represent the interests "and command the confidence of the water consumers." Such is the proposition to which the Committee have pinned their faith; and they declare that they "will not "allow any evidence to be called which goes behind" this particular paragraph. It seems to us that this is placing the Water Companies in a very peculiar position before the Committee. Are the Companies to be at liberty to bring forward evidence showing that the present supply is adequate in quantity, of excellent quality, properly managed, and given on reasonable terms? If such evidence is adduced, it must be for the purpose of proof; and, if these points are proved, what becomes of the incontestable "paragraph"? Or is all this evidence to be looked upon as so much "cracking up" of the existing supply, with a view to a good selling price? But the Committee are supposed to include within the scope of their inquiry the possibility of bringing in an entirely fresh supply, competing with that which now exists. If Sir Matthew White Ridley's Committee intend to take Sir W. Harcourt's report as their guiding star, they may adopt another paragraph, and declare that the existing Water Companies have "no monopoly" in the supply of water. Of course, it is quite a likely thing for them to embrace that doctrine. At the same time every unprejudiced man must know that, whatever may be the theory in this matter, a competing water supply in London is practically out of the question, so far as running rival mains along the same street is concerned. It might be possible to buy up one Company, and make one district the arena for showing off the wonderful things which a public authority is capable of accomplishing. But whatever conjecture we may indulge in, we must say that we are startled at the coolness with which the Committee have commenced by what may be called begging the main question. Changes may have arisen since 1880. Fresh light may now be available. The method by which the Companies propose to meet the coming demand, so as to avoid depleting the river, is not yet understood, or even known. For these reasons, we cannot but consider that the coming inquiry is unduly restricted, and that a mass of important evidence is likely to be shut out. If such evidence is not altogether excluded, the Committee will have to abandon some part of the position they have thus prematurely taken up.

The decision of Sir Matthew White Ridley's Committee to commence with the London Water Commission Bill seems reasonable. The Bill has the claim of priority; and its shadowy character admits of its ready disposal. Mr. Causton was of opinion that his Metropolis Water Charges Bill should be the first to come under consideration; but as this measure is not adapted to become law in the present session, the Committee have practically laid it aside. The Water Supply Bill of the County Council stands for second reading to-morrow, as also the Croydon Water Bill. When the Select Committee meet on Tuesday next, they will probably have these Bills before them; and, at all events, the reference may be expected in due time. The decision of the Committee to which we have just adverted, whereby a large preliminary question is treated as settled, very likely arises from a desire to curtail the inquiry, and to hasten the final report. We can hardly conceive that the Committee will be able to "rush" the inquiry, so as to arrive at a speedy conclusion. Yet even this is possible; and the *dénouement* may come more quickly than now appears probable. It is, as we have remarked, already decided by the Committee that the water supply should be "under the control of some public body." Proceeding from this as a starting-point, the Committee will have to advise as to the proper public body to be selected for the purpose—a Commission, a Trust, or the County Council. Another question is as to the water supply itself. Where is that to be found? In the present works, or in some new scheme? Or is that question to be left to the selected authority? As for placing the whole water supply "under the "control of some public body," that will not really be an unmixed blessing, unless the public body itself is placed under proper control. Let the average ratepayer ask himself what he thinks of the London County Council. Is that body more tractable and reasonable, more capable of being restrained, and better able to manage the water supply of London and its environs, than are the Metropolitan Water Companies? Where, we may ask, is the public body which shall "represent the interests and "command the confidence of the water consumers"? Perhaps, after all, the Commission Bill stands a chance.

Mr. Wilson Mappin was elected Deputy-Chairman of the Sheffield Gas Company at the meeting of the Board of Directors yesterday week.

Mr. J. L. Mitton has been appointed Manager and Secretary of the Longwood (Huddersfield) Gas Company, in succession to Mr. Neill Meiklejohn.

The Accounts of the London Gas Companies for the past year were presented to both Houses of Parliament last week, in compliance with statutory requirements.

Gas, Water, and General Investment Trust, Limited.—The Directors of this Trust have allotted 10,000 shares of £10 each, at a premium of 10s. per share, to the preferred and deferred stockholders whose names were on the register on April 10, in the proportion of, as nearly as possible, one share for every complete £50 stock held.

M. Aerts on Gas-Fitting.—The Gas Engineer of the Brussels Municipality (M. Aerts) gave a lecture on the 11th inst., at the Exhibition of Gas-Fittings in that city. He commented on the various systems of lighting and heating recommended by the Belgian Association of Gas-Fitters, and referred to the Wenham and the "Gaso-multiplex" lamps. He also alluded to the system of ventilation recently installed for the Association by M. Bandsept, whose name has on various occasions come before our readers in connection with improvements in gas appliances.

Cheap Non-Conducting Covering for Steam-Pipes.—A non-conducting coating for steam-pipes, &c., said to have been used with perfect satisfaction by a Boulogne engineering firm, is described in a recent issue of the *Revue Industrielle*. It consists of a mixture of wood sawdust with common starch, used in a state of thick paste. If the surfaces to be covered are well cleaned from all trace of grease, the adherence of the paste is perfect for either cast or wrought iron; and a thickness of 25 mm. will produce the same effect as that of the most costly non-conductors. For copper pipes there should be used a primary coat or two of potter's clay, mixed thin with water, and laid on with a brush. The sawdust is sifted to remove too large pieces, and mixed with very thin starch. It is the common practice to wind string spirally round the pipes to be treated, keeping the spirals one centimetre apart, to secure adhesion for the first coat, which is about 5 mm. thick. When this is set, a second and a third coat are successfully applied, and so on until the required thickness is attained. When it is all dry, two or three coats of coal tar, applied with a brush, will protect it from the weather.

Smokeless Fuel.—Last Tuesday week a trial of a new smokeless fuel, the invention of Herr Koopmann, took place on the premises of Messrs. Brewis Bros., York Road, King's Cross, in the presence of the Prince of Wales and other distinguished visitors. The principles and practical application of the invention were explained by the inventor and Mr. Guy Rottmann, the latter of whom is introducing it into this country. The fuel consists of dust or waste coal, which is reduced to a fine powder in a Hall disintegrator. The pulverized coal is then incorporated with a small proportion of pitch and some other mineral substances to the extent of from 7 to 10 per cent., according to the nature of the coal used. It is then, while in a plastic condition, moulded in presses, where it is submitted to a pressure of 2 tons per square inch, and assumes the form of briquettes about 8 inches long by 5 inches wide and 4 inches thick. It is stated that the mineral ingredients thus added produce during combustion a gas which not only consumes the smoke emanating from the coal, but also all noxious fumes. It is said that the ingredients, which are at present secret, are cheaper than coal, and can be readily procured in this country.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 739.)

THE course of events during the past week has on the whole put the Stock Markets down a little lower. The Foreign Market in general has been depressed; and the South American shows no better prospect. The advance in the Bank rate on Thursday, to 3½ per cent. (it had stood at 3 per cent. since the 29th of January), flattened prices at some extent. American rails continue about the strongest market, aided by the good prospect of satisfactory traffic receipts. Business on the whole has not been brisk; and though some believe they see indications of a resumption of healthy speculative activity, the signs are scarcely yet very clear. The Gas Market has been decidedly quiet; but its strength is undiminished. Stocks lately have been steadily moving up; but there is no indication of any disposition to realize profits—*bonâ fide* investment purchases being the rule. The changes in point of value effected in the week are less numerous; but they are all for the better, and are for the most part in the larger and more important Companies. In Gaslights, dealings in the "A" stock have been much more restricted; butprices are very firm, and the best figure of the week, 243⅞ (an unusually close price), was marked on Saturday. Not much was done in the secured and other issues; but what little was effected showed firmness, and the "K" is 2 higher. For some reason or other this, the last of the preferences, is the highest priced. Business in South Metropolitans has been very light. The "B," which was stationary the preceding week, when "A" and "C" advanced, has gone up 2. Commercials have shared the general quietude; a single transaction in the old stock being all that was done. Among the Suburban and Provincial undertakings, Brentford old is 3 higher, and the new is 2 higher; but there has been hardly any business done in any issue. Of the Foreign Companies, the Continental undertakings are very firm; Imperial Continental taking the lead with an advance of 2½. Monte Video has made a further improvement of ½; the selling price being par. Sydney debentures are 1 better. Water is weak; and some issues were offered on easy terms. Lambeth has fallen 4; and East London, 2.

The daily operations were: At the opening on Monday, Gas issues of all sorts ruled very firm. Business, however, remained rather restricted throughout the day. Gaslight "K" rose 2; Sydney, 1; and Monte Video, ½. Water was quite neglected; but East London fell back 2. Gas was even quieter on Tuesday; but quotations continued to advance. Brentfords improved as noted above; and South Metropolitan "B" rose 2. There was some business done in Water, but at reduced figures; and Lambeth receded 2. Business in Gas was more animated on Wednesday; but the only move was a rise of ¼ in Imperial Continental. Water was again offered; and Lambeth fell 2 more. On Thursday, business in Gas was very small indeed, and nothing moved. Water was quiet and unchanged. Dealings in Gas on Friday were much the same; prices of everything being excellent. Water was as before. Saturday's Gas business was fairly brisk. Imperial Continental rose 2. Water was not touched.

ELECTRIC LIGHTING MEMORANDA.

Electric Lighting a Failure for Railway Trains—The Grosvenor Gallery Installation in trouble again—Mr. Crompton on the Cost of Electrical Generation and Distribution—Birmingham (or Brummagem) Charity?

THE observations to be found in another column on the failure of electric lighting for railway trains ought to be taken note of by those whom they concern. The fact that, after many years of experimenting upon all the great lines in the kingdom, electric lamps do not increase and multiply in ordinary trains, must have been dimly perceived for some time past. But the more definite fact of the Great Northern Railway Company having recently spent a great deal of money in putting up Pintsch lighting plant must be esteemed as practically settling the question of what is to be regarded as "the light of the future" for railway carriages for at least one leading Company. If there had been the faintest prospect of electric train lighting coming to the front within a reasonable time, we may be sure that one of the Companies who have to compete for the traffic between North and South would have hesitated to commit themselves to oil-gas lighting, and thereby permit their rivals to advertise the newer system as an attraction to travellers. It is very certain, however, that the management of the Great Northern Railway Company are wise in deciding to adopt what is really good and practical in the way of carriage lighting, and not to wait any longer for something that is in the same promissory stage now as it was ten years ago, and may never be any good after all. Moreover, it cannot be said that the Great Northern people have not experimented abundantly with the electric light, or have not waited to see what other railway companies can make out of it. The rumour that the Brighton Company, who rather make a point of electric lighting, have to send a man specially with every train fitted with this means of illumination, goes some way to explain the action of the Great Northern Company. At any rate, while the Pintsch Company have every reason to be proud of their new conquest, the electricians will have to admit that it is a "smack in the face" for them.

The London Electric Supply Corporation have not yet seen the end of their troubles in connection with their Grosvenor Gallery distributing station. An action instituted against the Corporation by Messrs. Savory and Moore, the well-known West-end druggists, was before the Court last week, and has only been adjourned for three months in order to allow the defendants to put their house in better order than is thought to be the case at present. The druggists have premises backing on the spot where the Corporation formerly generated current, but now merely receive it from Deptford prior to distribution. They have never liked their neighbours, and long ago gave them to understand that they did not think the back of Bond Street a proper place for the establishment of an extensive steam-power generating works. When the plant was removed, there was a presumption that all objection would go with it; but the fact of the new arrangement having been ushered in by a disastrous fire not inexcusably led the druggists to form a stronger opinion than ever that an electric lighting concern is an undesirable neighbour. They have consequently taken the necessary legal steps to rid themselves of such objectionable company, and not altogether without success; for, though the electricians are not summarily condemned, it is clear enough that they will have something serious to do if they are to save their position upon the resumption of hostilities. The great point that is made against them is the risk of fire, which they cannot possibly "pooh-pooh," as they would like to do. The neighbours very reasonably say that since no insurance company will protect them against the certain loss of profit, and the equally inevitable inconveniences, attending a fire, they will not sit down and let anybody play dangerous tricks next door. The electricians may think the druggists inconsiderate; but they have themselves to thank for this trouble. There was no reason at all, in the nature of things, why the Grosvenor Gallery site should have been converted into an electric light works. It was originally a picture gallery and restaurant; and when the proprietor decided to light it by electricity, he might have confined himself to his own premises. Instead of doing so, he went outside to rake together a connection whom he could supply at a profit. The whole affair was taken over at a high figure by the London Electric Supply Corporation; but it is beginning to look very much like a *damnosa heritas*.

A paper on the "Cost of the Generation and Distribution of Electrical Energy" has lately been read before the Institution of Civil Engineers by Mr. R. E. B. Crompton. Unfortunately, although the paper aimed at being severely practical, it dealt a good deal with what ought to be done "in the future" in the matter of electric lighting from central stations. The author admitted that, though dynamos have now the high efficiency of 96 per cent., and the loss in distribution is already as low with some systems as it can be expected to be, the actual performance of electrical generating stations bears no relation to what might be theoretically expected of them. This is explicable by reference to several considerations, but principally by the discrepancy between the actual output at any given time of a plant and its capacity if working continuously at full load. When Mr. W. H. Preece is advising a local authority to spend money upon an electric lighting plant, he prefers, as we recently pointed out in the case of Bristol, to assume that the plant will be worked at its full capacity. As a matter of common record, however, Mr. Crompton says that the load-factor of the Kensington and Knightsbridge Company for August last went down to 2·5 per cent.; while the best return of the St. James's and Pall Mall Company was 41·5 per cent. on one occasion. Of course, Mr. Crompton condemned the high-pressure alternating transformer system, which he does not patronize, as being by no means so economical as it looks. It is to be supposed that all these rival electricity doctors will have their say in rotation. General Webber began it a few weeks ago by extolling the Chelsea system. Mr. Crompton has now had his turn. It only remains for Mr. Gordon and Mr. Ferranti to speak, in order to leave matters precisely where they were before.

Something very comical has transpired with regard to the appropriation of the profits realized from the Birmingham Electrical Exhibition of 1889, which was advertised at the time as being intended to benefit the local medical charities after payment of the "incidental expenses." The Committee were self-appointed; and there was something about the promotion arrangements which caused some local people to keep clear of the affair. Yet the scheme of the undertaking was sufficiently plausible to secure the nominal patronage of a number of public men, from Lord Salisbury downwards. After the whole business was over, however, it turned out that the philanthropic and charitable individuals who got up the scheme were so imbued with the wisdom of the aphorism "Charity begins at home," that they appropriated among themselves all the money over, with the exception of a beggarly balance of £50. As this sum, divided among three hospitals, would have looked too mean even in the estimation of these enterprising gentlemen, they docked themselves of £25 each to make up the magnificent grant of £101 7s. 2d. apiece to the favoured institutions. The authorities of the latter were by no means satisfied with this dole, and insisted upon an examination of the accounts of the exhibition, which revealed such very charitable payments as £500 to the Secretary, and 200 guineas each to nine promoters.

It is only fair to say that when the matter was put in a fresh light before the Chairman of the Exhibition, he handed over his own share of the proceeds; but the others who constituted the "syndicate" have failed to see why, when charity has been made to begin at home, it should not stay there. It is hardly necessary to say this affair has made a painful impression on the Birmingham public, who know both charity and business well enough, but are accustomed to keep them separate.

A MODEL OIL-GAS WORKS.

THE friends and supporters of the great industry of gas lighting are justified in thinking and talking as though coal gas were the only product of the kind worth regarding in connection with the question of public and private lighting upon the large scale. At the same time it should be remembered that coal gas is not the only description of gaseous illuminant doing good service in the world; and that even in the United Kingdom (the nursery and home of coal gas), the more ancient manufacture of oil gas is a distinctly flourishing and fast-growing industry. In point of fact, oil gas, made from fluid mineral hydrocarbon, should possess a high degree of interest just now for coal-gas engineers, on account, first, of its unique position as a successful competitor with electricity in respect of several special applications; and secondly, as bearing upon the problem of carburetting. And when we speak of the successful oil-gas industry, we mean the operations of the Pintsch's Patent Lighting Company, Limited, who have secured the practical monopoly of this trade. For many years this Company have been plodding on with their compressed portable oil-gas lighting schemes; and every year the range of their work has been extending at home and abroad, until the business has grown into the very important affair it is at the present day.

Pintsch gas, as everybody knows, is in great and increasing demand for lighting railway carriages; and of late years it has been adapted with complete success to the lighting of buoys. For the latter purpose there is nothing like it, for the buoy itself seems to have been intended from the beginning for a reservoir of gas; and the convenience to navigation of being able to have channels marked out with lights that can be trusted to go on without attention for three months, if need be, only needs mention to be appreciated. It is in the matter of railway carriage lighting, however, that the position and prospects of the Pintsch system are most interesting at the present time, in view of the desperate efforts that electricians have made to annex train lighting, as they have monopolized ship lighting. And in connection with this branch of business, it is now possible to assert, as an ascertained fact, that electricity, in all the multitudinous arrangements that have yet been tried for this purpose, has been unable to win the favour of railway managers as a practical means of carriage lighting. This is a most important and significant result, as exemplifying the truth that the so-called "crude and unscientific light of combustion," upon which superfine apologists for electricity have poured so much contempt, so far beats the "scientific" incandescent lamp in a field which presents about equal difficulty for both systems of lighting. It is therefore not an unfair point to urge against the electricians that they should make good their ground against Pintsch gas for railway carriage lighting, before claiming to be able to meet elsewhere, on anything like equal terms, the system of gas lighting with which the Pintsch system does not attempt to compete for general uses.

Pintsch gas, as already remarked, is interesting to coal-gas engineers in a technical way, as helping to elucidate the problem of carburetting. For it may be said without fear of contradiction, that after so many years of practice under all sorts of conditions, and in almost every imaginable locality, what the Engineers of the Pintsch Company do not know about carbonizing oil for gas making is not worth knowing. It is perfectly idle, therefore, for any oil-gas enthusiast to go about attempting to deceive people as to what can be done by way of producing gas from oil by distillation or carbonization in a closed retort, while the experience of the Pintsch engineers is available for reference. And it must be understood that there is nothing at all peculiar about Pintsch gas, which is merely so called because it is the kind of gas preferably employed in the Pintsch system of portable gas lighting. The gas itself is made in the simplest possible manner, which is indeed the only practicable manner, from a material which anybody is free to use in the same way. The system is a whole—beginning at the oil-gas retort and ending at the lamp. Apart, let us say, from the ingenious reducing governor, the Pintsch system now contains no patented specialty or trade secret; having won its way simply upon its merits as a completely worked-out mode of portable gas lighting. Several rivals have disputed the field with it; but we are not aware that any of these has very much vitality at the present time. At any rate, the plain fact that, while the Great Eastern Railway Company still work at Stratford the Pintsch gas plant they put up there many years ago, when the system was first introduced into this country, the Great Northern Railway Company have just erected at Holloway the largest and most complete plant of the same kind in existence, is good evidence in support of the claim of this system of gas lighting to respectful consideration.

We recently had the pleasure of inspecting the new Holloway works, and are able to recommend a visit to this establishment to all engineers desirous of learning what can be done with oil as a gas-making material, irrespective of the purpose for which it may be ultimately wanted. A brief general description of these works will more clearly explain the process of oil-gas making than any statement of the general principles involved in the manufacture. The factory has been built by the Great Northern Railway Company, according to the plans of the Pintsch Lighting Company, for the supply of compressed oil gas to trains stopping for the purpose at Finsbury Park. We shall not attempt to deal with the details of the carriage lighting fittings and their management, which is the Pintsch Company's business. Our interest for the time being begins and finishes at the gas-generating station. Here we find a long range of substantial, but plain, brick shedding, covered with corrugated iron roofing. In the middle of the range is a transept with a slightly higher roof, which breaks the monotony of the line, and, as we afterwards discover, houses the boilers, which are provided with a handsome chimney-shaft. At each end of the buildings stands a counterpoised 20 feet by 16 feet gasholder in an iron tank. Curious investigation of the water in the tanks discovers a faint, but unmistakeable smell of volatile hydrocarbon. The works are double. The boiler-house in the centre contains three boilers (one as reserve); and, on each side of it extend engine-house, retort-house, and purifier-house in the order named. The retort-house contains eight settings, each containing two pairs of retorts. The Pintsch retort, as evolved from much experience is a 10-inch iron ⊓, 6 feet long. It rests, of course, upon fire-tiles. These retorts are connected vertically in pairs, one over the other. The oil supply, adjusted by a micrometer cock which permits of the rate of flow being set to the greatest nicety, runs by gravity from an overhead tank into a funnel on top of a syphon-pipe which passes through the lid of the top retort, and, being continued inside about 12 inches, directs the oil into a loose thin sheet-iron tray, about 2½ inches deep, which occupies the whole length of the retort floor. This tray is changed and cleaned from carbon once a week. The oil, as such, never therefore touches the retort itself. It is first boiled and then vapourized in the upper retort; and the vapour escapes at the opposite end to where the oil entered, and passes downward through a mouthpiece casting, which is also connected with the lower retort. Being next the furnace, this lower retort is noticeably hotter than the upper one, or vaporizer. Here the vapour is gasified, as far as its nature permits, having to pass through 6 feet of full cherry-red retort to the other end, where it turns downward through a short descension-pipe into a hydraulic main. In order to allow for the expansion of the retort when heated, the joint of the pipe with the hydraulic main is made as a ball and socket rendered gas-tight with plumbago.

The last mouthpiece in the series is fitted with a test-pipe and cock, by opening which the man in attendance can judge from the colour of the escaping vapour how the retort is doing its work. The vapour ought to be of a pale straw colour in the darkest part; if it is too dark, it is a sign that the retort is burning the gas, and a little more oil is allowed to run in. In practical working there is no difficulty in gauging the rate of flow of the oil for hours together when the fires are properly attended to. There is thus but one question to be asked in working this kind of plant—either the retort is properly gasifying the oil or it is not, and this can be determined for all practical purposes by a glance at the crude gas. The pair of 10-inch retorts makes, in the ordinary way, 450 cubic feet of gas per hour. The oil used is what is called "gas oil" by paraffin candle makers; being the first residue of Scotch shale after the paraffin wax has been extracted. It runs from 0·860 to 0·875 specific gravity, with a 250° flashing-point, and is worth about £5 per ton, or 5d. per gallon, delivered. This is the oil which the Pintsch engineers prefer when they can get it. The same plant will, of course, make gas out of any oil; and in many places it has to do so, either regularly or on emergency. In a sense, Russian or American petroleum, castor oil, animal oil—anything liquid, composed of hydrocarbons, can be dealt with as a makeshift; but there is nothing that works so cleanly as this once-refined Scotch shale oil, which is of a pale yellow colour, and has a rather strong smell. It makes gas at the average rate of 90 to 95 cubic feet per gallon; and works out in the long run to 11 gallons per 1000 cubic feet. The photometrical value of the gas is 40 candles, and does not materially vary.

At Holloway, there is not yet enough demand for the gas to require day and night working; and consequently the heat of the retorts suffers from damping the fires every night. The furnace is of the simple direct-acting order, and is not pushed very hard. Each setting of a pair of retorts burns about 8 bushels of coke per day, which at the stated rate would make upwards of 5000 cubic feet of gas in the twelve-hour shift. This is a good production for the size of the plant. Not more than the single pair of retorts can be satisfactorily worked in one setting. More have been tried at different places; but the trouble from irregular expansion, &c., was more than the saving in fuel was worth. It is now preferred to put two arches, each containing its pair of retorts, in a bench, and make one short chimney serve the two furnaces. The gas as soon as made deposits tar in the hydraulic main, which is emptied and replenished with fresh water every day. This tar is fit for use for the common purposes

of coal tar; being dense, and drying with a good finish. What may be its distilling value does not appear, so little being made. The gas next passes through a pair of vertical condensers—mere empty cylinders of sheet iron, of considerable area compared with the connections—and then through water, washers, after which it is purified by a mixture of two-thirds slaked lime and one-third sawdust. Carbonic acid, sulphuretted hydrogen, and ammonia are taken out by this means.

The residual tar and liquor are of little or no value; but the former is worth about 1d. per gallon to burn. It is so nearly of the same specific gravity as water, that the two take a long time to separate in the tanks. There is nothing to be gained, as some might imagine, by returning the thin tar to the retorts. It would, perhaps, make a little gas, but give more trouble. It has been tried, of course; but the most profitable way of treating the residuals is found to be selling them for what they will fetch. It should not be overlooked that when the gas, compressed by the steam-pumps to 140 lbs. per square inch, is stored in the large cylinders kept for the purpose (there are ten of them at Holloway) a volatile hydrocarbon condenses out of it which sells readily for 1s. per gallon. About a gallon of this spirit is recovered from every 1000 cubic feet of gas made; so that it is an important residual. Another article would be required to describe the compressing, storing, and distributing arrangements, which have to be very specially done in consequence of the high pressure of the gas and its insidious nature. For example, the mains are strong lead pipes, and the store holders are double-tinned. With all this, however, we are not particularly concerned. We have sufficiently described how the best-known process of oil-gas manufacture in closed retorts is carried on, and given the chief results. The Pintsch Company claim that, at the current prices of all materials, they can deliver their gas at the burner, including cost of compression and all charges, at about 6s. 6d. per 1000 cubic feet. This does not seem an extravagant statement. We can bear witness to the thoroughly workmanlike way in which the Holloway station has been constructed. It is a model works of the kind.

NOTES.

Producer Gas Made with Oxygen.

Discussing the question of fuel gas in a recent issue, our American contemporary *Progressive Age* remarked that producer gas processes are very fascinating for everybody who has given much thought to the subject of gaseous fuel. The apparatus in question is attractive because it is so simple in its construction and operation, and gives in a gaseous form the maximum proportion of the original energy of the coal. Here would be a ready solution of the fuel-gas problem, were it not for the bulky nature of the product. In thus gasifying the coal, it is necessary to introduce such a large proportion of nitrogen, that the product is reduced in quality to a degree that makes it uneconomical and unsafe for domestic purposes, while at the same time its bulk is so increased that the mains for its distribution would have to be impracticably large. The fact that producer gas is unsuitable for distribution as fuel has come to be so generally recognized, that this class of apparatus is now excluded from attempted solutions of the problem of fuel gas—attention being centred upon those processes which make a gas practically free from nitrogen; the producer gas formed even during the blowing stage of water-gas making being relegated either to heating retort-settings wherein bituminous coal is being carbonized, to raising steam, or to some other purely local use. The recent reduction in the cost of making pure oxygen has, however, suggested to our contemporary that if this reduction could be continued to a sufficiently low point, it might be possible to return to the producer for the direct gasification of solid fuel, using oxygen in the operation, whereby, of course, the objectionable nitrogen diluent would be absent. It is computed that with a coal (anthracite) composed of 90 per cent. of carbon, pure oxygen would give for every 2000 lbs. some 80,000 cubic feet of gas having this percentage composition: Hydrogen, 29·28; carbonic oxide, 70·72. This gas would contain about 323 heat-units per cubic foot, and have a specific gravity of about 0·70; neither of which data constitutes a recommendation. To make 1000 cubic feet of the gas would require theoretically 24·96 lbs. of coal, 17·09 lbs. (or 203 cubic feet) of oxygen, and 14·34 lbs. of steam. Correcting the computation by some working data supplied by Mr. Glasgow, it would appear that the gas as made in a good producer might be expected to show the following percentage composition: Hydrogen, 26·7; carbonic oxide, 73·3. It would have a calorific value of 323 heat-units per cubic foot; and a yield of about 77,000 cubic feet per short ton of 2000 lbs. How the oxygen would work in the producer is, of course, a lively question. It is admitted that, at present, prices are against the idea.

Tumble-down Vaulting.

Retort-setters and other workers in brick are sometimes at a loss for centring to carry lengths of small or large span vaulting. It is not so generally known among this class of artificers as it should be, that Oriental bricklayers have from the remotest antiquity practised a handy method of turning vaults without centring. Notice was first directed to these vaults by Mr. Layard, who discovered many examples of sewers, &c., built in this way; and recently Professor W. R. Ware, of the Architectural Department of Columbia College, made the system the subject of a lecture and experimental demonstration in some school grounds in New York. The principle of the device is simply the laying of the courses of the arch at a sufficient slope to enable the bricks composing it to retain their position by their own friction until the course is complete. Either a semicircular or a pointed arch can be quickly built in this way without centring. The work looks odd while in execution because all the arch courses, instead of running at right angles to the line of the tunnel or flue, as when built in the ordinary way, look to be lying down at a considerable angle from the perpendicular. Of course, a firm abutment must be secured to begin with, or the arch courses will simply tumble down. It would not be at all a bad title to give this style of vaulting—the "tumble-down arch," because the courses look exactly as if somebody had given them a push from one end before they were set, and made them lie along in the direction away from that in which the work was built. It is certain, from the American experiment with this most archaic style of brickwork construction, that unskilled or partially-trained bricklayers can readily acquire the knack of laying the sloping arch bricks at the right inclination, and that a long drain or flue can be quickly covered over in this way without spending time and material in setting centres.

The Production of Oxygen and Hydrogen by Electrolysis.

The production on a commercial scale of oxygen and hydrogen by electrolysis of water has been investigated by Commander Renard of the French service since 1887. Taking the counter electro-motive force at 1·5 volts, and the total efficiency of the plant at only 50 per cent., M. Renard has informed the Physical Society of France that he is able to produce a cubic metre of hydrogen for every 10 horse-power hours of working. Reckoning the consumption of fuel at a kilogramme per horse-power hour, the cost of fuel only for every 1000 cubic feet of the mixed gases at atmospheric pressure can be computed according to the cost of coal in any particular locality. To make the commercial electrolytic operation at all feasible, it is necessary to find some substitute for the costly platinum electrodes and of air-tight partitions for collecting the gases. M. Renard uses an alkaline electrolyte, consisting of a 13 per cent. solution of caustic soda, and is therefore able to substitute cheap cast-iron electrodes for the platinum. Porous pots of asbestos fibre are employed for collecting the gases. As in use at M. Renard's Chalais works, a large cylinder of common sheet iron serves at the same time as the container of the electrolyte and the negative electrode. The positive electrode is a perforated iron tube fixed upon an insulated lid, which fits gas-tight over the top of the vessel. This electrode is surrounded by a large asbestos bag. Two arrangements of the kind have been at work at Chalais for six months, at the end of which time both the electrodes and the asbestos bags were in perfect order. The gases obtained are pure, and there is no ozone. According to M. Renard, a battery of 36 large voltametres would be required to generate about 200 cubic feet of hydrogen and 100 cubic feet of oxygen per hour, both of which could be compressed for use by ordinary means. The total cost of the gases obtained by this process, ready for use in steel bottles, is estimated at from about 12s. to 15s. per 1000 cubic feet.

Imperial Continental Gas Association.—A dividend of 5 per cent. and a bonus of 1 per cent., both free of income-tax, for the half year ending Dec. 31 last, will be proposed by the Directors of this Association at the half-yearly general meeting on the 5th prox.

North of England Gas Managers' Association.—The twenty-eighth half-yearly general meeting of this Association is to be held next Saturday, at the offices of the Newcastle and Gateshead Gas Company, under the presidency of Mr. W. Hardie jun., Engineer and Manager of the Tynemouth Gas Company; and the proceedings promise to be interesting in several respects. The formal business will comprise the passing of the accounts for the last twelve months, and the election of office-bearers for the ensuing year. The first-named matter will, of course, be mere routine; but the other will bring the members face to face with an unusual set of circumstances. According to the circular which, as Honorary Secretary of the Association, Mr. Hardie has issued, the Committee have had to consider the position in which the Association have been placed by the much-regretted continued indisposition of Mr. J. H. Cox, jun., who was to be Mr. Hardie's successor in the chair, but who desires that his election as President should be postponed; and they therefore strongly recommend that, inasmuch as the Chairman of the South Shields Gas Company (Robert Wallis, Esq., J.P.) purposes joining the Association, he should be asked to fill the position, to which they consider his long and valuable services to the gas industry justly entitle him. Mr. Cox will, of course, be continued as Vice-President. The other business will consist of a paper on "District Pressure," by Mr. David Terrace, of Middlesbrough; and, following the course lately adopted of having informal conversations upon matters of interest, Mr. Hardie will open a discussion on the question of the advisability of owners of gas-works taking up the business of tar and ammoniacal liquor distillers. At the close of the proceedings, the members and friends will dine in the County Hotel.

COMMUNICATED ARTICLE.

LUMINOUS AND NON-LUMINOUS COMBUSTION.

FOURTH ARTICLE.

By B. H. Thwaite.

Graduated Combustion.

It is possible to so graduate the supply of air to the combustible element that an attenuated, or long-drawn-out character of combustion may be established. The essential condition of such a form of combustion, which is applicable and useful to many industrial operations, may be described as follows: The combustion chamber and flue must be entirely refractory or fire-brick lined; and such lining must be of sufficient thickness that the loss of heat by convection and radiation shall not be such as to reduce the internal surface temperature of the lining below 900° Fahr., or a ruby-red heat. For stoves or other small domestic heating contrivances, the refractory lining may be merely 1 inch in thickness; for a combustion chamber, 5 feet in length, the lining should be at least 3 inches thick; whereas for longer and more capacious chambers, the thickness of refractory lining must not be less than 4½ inches. When once the lining has attained the temperature stipulated, the carbon will not lose its "range of chemical action temperature;" and if there is any circumambient air, its contact with the carbon will result in the oxidation of the latter.

If we refer to the sequence of effects described in preceding articles as constituting combustion action, we find that the carbon atoms set free from the zone of hydro-oxidation are in a condition of incandescence; and that if there is any surrounding air, the carbon is oxidized to carbonic acid. If this temperature of incandescence is maintained, it is therefore obvious that if, in any interval of time after the initial ignition, air is brought into contact with the carbon, it will be oxidized; and there is thus no reasonable limit to the length of a luminous flame existing under the prescribed conditions. If, on the other hand, the condition of carbon incandescence is destroyed by the refrigerating influence of cold sides, such as naked iron plates that are so thin as to prevent their accumulating the heat equivalent to a surface temperature of 900° C., the chemical action of the oxidation of the carbon cannot take place, and carbon is deposited as soot.

Here we have an explanation of nine-tenths of the smoke-producing combustion systems in existence. The obvious remedy, therefore, is to encase the *locale*, or chamber of combustion, wherever the purpose admits it, with lining walls of fire-brick, asbestos, or any other refractory material that can be raised and maintained in a condition of incandescence so as to prevent any possible refrigerating action that shall tend to reduce the temperature of the carbon atoms to too low a degree to enable them to combine with their oxygen equivalents when the latter are supplied to the carbon.

The Volumetric Capacity of the Combustion Chamber.

Inadequate combustion space is a common defect in systems of combustion designed for heating purposes. The great degree of volumetric increase after combustion is clearly apparent by an examination of an equation of combustion. Let ϕ represent the temperature due to combustion, and 273 the coefficient of dilatancy due to increase of temperature in centimetres; then:

$$(2H + C) + (3O + 12N) = (H_2O + CO_2 + 12N)$$

And the increased volume is measurable thus—

$$\frac{\phi\,(H_2O + CO_2 + 12N)}{273}$$

If we accept ϕ as equal to 2730—a not unfair assumption—it will be seen that the total volumetric increase is equivalent to ten times the original volume. Hence the advisability of providing adequate combustion space. If a mixture of such gas and air accumulated in a closed combustion chamber, a pressure of upwards of 10 atmospheres would be developed. It is therefore advisable to prevent such accumulation of gas and air, by first clearing the combustion space from gas, filling it with air, and then igniting such combustible gas immediately at the point of emission.

Mr. F. Hill has been appointed Manager of the Milnthorpe Gas Company, in succession to Mr. H. Lawton, who has relinquished the position in order to take up a similar one with the Carnforth Gas Company.

Presentation to Mr. J. Skinner.—Last Saturday week, a number of the foremen and workmen employed in the mechanics' department of the Glasgow Corporation Gas-Works presented to Mr. John Skinner, the outdoor foreman, a testimonial in the shape of a handsome timepiece, in token of their respect and esteem for him, on the occasion of his leaving the service of the Corporation to take a similar appointment in Aberdeen. The presentation was made by Mr. Fullerton, Superintendent of the department, who gave some particulars as to the extent of the work in which Mr. Skinner had been engaged. He concluded by wishing him, on behalf of the donors of the gift, which, he said, was offered as a memento of the pleasant relations which had subsisted between them, long life and prosperity in his new position. Mr. Skinner suitably returned thanks for the present, and for the good wishes accompanying it.

TECHNICAL RECORD.

NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

The Twenty-First Annual Meeting.

(*Concluded from p.* 698.)

At the request of the President, Mr. G. Shepard Page, of New York, addressed the meeting on the subject of residuals, the increasing value of which, he said, caused a number of companies who had been thinking of adopting water-gas processes to hesitate. Many gas undertakings in the United States now recovered almost the entire cost of their coal in the proceeds from the sales of tar and ammonia; and some realized as much as 6s. 3d. per ton of coal carbonized for the tar alone. The value of ammonia would always be limited by foreign market prices; and as sulphate could be delivered in America (inclusive of duty, freightage, and commission) for about 1⅛d. per pound, this fixed the value of ammoniacal liquor. But any company who did not get from their ammoniacal liquor at least 10d. per ton of coal carbonized, were not doing so well as they ought to do. The causes of the advance in the price of tar were, first, the diminished production due to the adoption of water-gas processes; and, secondly, to the enormous advance and increase in the consumption of coal-tar products. In the West and South-west there were large quantities of coal that crumbled on exposure to the air; and coal-tar pitch was found the best material available for binding the dust in the form of briquettes. Several American railway companies had erected plant for this purpose; thus following a plan that was very largely carried out in Europe. But at present all the pitch thus used was imported from England. The pitch produced in America was principally employed for gravel roofing, and no hard pitch was made, because anthracene was not produced. But he looked forward to the establishment of anthracene and alizarine businesses in the States, for they would not continue to pay upwards of a million sterling to European countries for a product that existed in their own tar, and was required by their dyers. The creosoting of wood for preserving it from decay and destruction by the marine worm, was another great industry that was becoming well established in the States; and at present nearly all the heavy oil produced was utilized for this purpose. Creosote oil was shipped from London round Cape Horn and used on the Pacific coast. Then there was a large demand for tar in the manufacture of concrete pavements, and for tarred paper to be laid under slate roofs, weather-boarding, &c. Coal tar was conveyed as great a distance as 1200 miles to be used for this purpose. Sometimes two-ply and three-ply roofing was prepared; the layers of paper being caused to adhere by means of melted pitch. This was an industry that had sprung up within the last few years, and was likely to increase, as it made the cheapest roof that could be put upon a house. A roof that would last from three to ten years could be made at a cost of 1d. to 2d. per square foot. Ammonia was largely in demand for ice making. In many towns the artificial product could well compete with natural ice, and cold storeage warehouses were increasing. Apart from prices, the machines afforded a means of adjusting the temperature as desired, which could not be secured by the use of ice alone. While he did not believe in the substitution of water gas for coal gas, he was in favour of getting the largest possible yield of gas out of the coal, and enriching it as required by adding carburetted water gas.

After a conversational discussion, Mr. Page said, in reply to questions, that the manufacture of tarred paper was a simple operation that could be conducted at any gas-works; but the finding of a market for it might not be so simple. The tar made with high heats and regenerative furnaces was not good for this purpose, as the paper was apt to stick. This was an important item for the managers of small works, where the ordinary style of setting was used. Their tar should realize from 30 to 50 per cent. more than the thick heavy tars from regenerative furnaces. The best price for tar that he knew of in New England or the Middle States was a little more than 16s. 8d. per barrel for large quantities. It would not be practicable to ship tar from England in the tank steamers that were used for the conveyance of naphtha and petroleum to that country, because a tank that had once had coal tar in it could not be used for oils.

Mr. H. A. Allyn read a paper treating of the various tools used in gas-works. Beginning with the auger commonly used for cleaning stopped ascension-pipes, he objected to it on the ground that, as it was only about 2½ inches in diameter, it would merely make a hole of corresponding size in the deposit. The pipe-cleaner that resembled two arrow-heads set at right angles possessed considerable merit, as it could be readily forced into a pipe, and it scraped the hard pitch off the sides in withdrawing. But both this and the flat diamond-pointed chisel-edged head that was often used, had such narrow cutting edges that, unless more time was devoted to the cleaning of the pipe than was usually the case, the pitch was only cut out in notches, leaving the pipe in such a condition that it quickly became clogged again. He preferred a head consisting of a steel band 2 inches wide, 4½ inches in diameter at the cutting edge, reduced to 4 inches at the back, and connected to the rod by two arms. A tool of this shape

could be used with less expenditure of labour than many others, and would not jam in the pipe, while at the same time it cut a large hole. An ordinary long-handled garden spade was a convenient tool for cleaning the burnt luting off the retort-lids; and many lids were broken or bent by reason of this not being done properly. With regard to drawing-rakes, a good form was that made of a single piece of flat iron of the proper section, bent not too sharply, and the shank drawn down to the diameter of the rod. Heads secured to the rod by a nut, or by riveting, soon worked loose. He made his rakes by taking a piece of flat iron 12 in. by 3 in. by ¾ in., and welding on a piece of 1¼-inch round rod about 1½ inches from one end. The rod proper, ⅞ inch in diameter, was welded to this. The head being heavy and rigid, it readily entered the coke; and the sharp corners would go into the angles of the retorts, enabling the work to be well and quickly done. He made the front walls of his retort-settings three bricks thick, and used "dogs" made of 1¼ in. by ⅜ in. iron, in order to keep the mouthpieces in place in case the bolts burned through. He had tried steam, also hot air, for cleaning the retorts, and preferred the latter. A pattern of "carbon-burner" that was in common use was made with flat sides and top and a semicircular aperature on the under side for the admission of the air. It was apt to fall to pieces by reason of unequal expansion or contraction. The cause of this was the unequal thickness of the material; and so he recommended that the burner should be made of equal thickness throughout. In the purifier house, an overhead track between the store-room and the purifier, with a simple device for supporting a tub, and switches, &c., as required, would enable the lime or oxide to be moved more quickly and easily than by the common barrows.

In the course of the subsequent discussion, Mr. Stiness enlarged on the advantage of making the retorts square or rectangular at the neck, so as to fit the front wall without blocking. It was an advance on the Davidson retort, in which flat bearing-places were provided wherever saddles had to come. He also referred to the advantage that would follow on having a standard template for the front face of the retorts, so that one mouthpiece would fit any retort.

The "question-box" was next dealt with. Mr. Leach, in answer to the question "What are the advantages of the cartridge method of applying enrichers?" said it gave him better results than he could get by injecting the oil by gravity. Knowing how much oil was put in, he could tell exactly how much was used; whereas with injection he could never be sure of the quantity. He used a piece of 4-inch wrought-iron pipe, 4½ feet long, plugged at one end, for a cartridge. It was filled with fine breeze, and the oil poured in at the open end. The breeze was partly burned to an ash, which came out easily; and he had pipes in use for three months or more before they were spoilt. His retorts were set in beds of six, which were charged three at a time; and the usual rule was to put a cartridge in the middle retort at each charge. He used paraffin oil of about 40° Beaume; and the quality of the gas was more even than with the old method. He kept it at not less than 19 candles by the jet photometer. The quantity of oil used varied according to the coal; but it was about 5 gallons per ton. There was no leakage round the mouthpiece of the retort, which was apt to occur with the injection method. Mr. Coffin agreed that the cartridge system was the better one, as securing a proper working off of the oil, and no leakage. He used a 3-inch pipe, and did not take out the breeze so long as it would absorb the charge, which was a gallon of oil each time. He used one cartridge to every three retorts charged. Mr. Fowler also preferred the cartridge system, and used a pipe with a block at one end in preference to having the end welded up.

On the question as to "How much can leakage be safely reduced by governors?" Mr. Slater thought the supply pressure was a question of local circumstances. He could not do with less than 2 inches in his district; and any attempt to reduce it lower would only lead to complaints. The President (Mr. C. F. Prichard) believed in large mains and the lowest possible pressure. Although his day consumption was considerable, he could do with 12-10ths; and with this he supplied stoves, &c.

In reference to the smallest size of cast-iron pipe that should be laid, some thought 6-inch and others 4-inch. Mr. Nettleton said that recently he had occasion to look into the practice at some Western gas-works, and was much surprised to find that wrought-iron pipe up to 6 inches in diameter was coming largely into use. Though the first cost was higher, it was considered that the additional soundness and greater speed in laying compensated for it. The service-pipes were drilled and tapped as with cast iron. Mr. Lamson thought wrought-iron pipes would not last so long as cast-iron ones in city streets. Mr. Shelton said that if large wrought-iron pipes were employed they should always be coated. He adopted the coating used by General Hickenlooper, of Cincinnati, which consisted of rubber, tar, lime, and turpentine. This was found to be an efficient protection. It could be made at the works, and sufficient pipes to last a year could be dipped in a day. The fitters carried a small pot and brush, to make good nicks caused by the tools in screwing up. He was a believer in wrought-iron pipes, as they could be laid absolutely tight. Mr. Allyn called attention to some samples of wrought-iron pipe, sheet iron, &c., that were lead coated, inside and out. Boiler-plates could also, he said, be so prepared; and the lead was claimed to be a preventive of rust or decay from dampness. He had used nothing but galvanized pipe for twelve years; but sometimes the galvanizing spoilt the fibre of the iron, or the pipes were half full of oxide.

Another question was as to trouble from pitchy deposits in the pipes when working water-gas processes. Mr. Harbison and others said they had no such trouble; and Mr. Neal only had a little naphthalene in the autumn. Mr. Jones suggested that the vaporization of the oil previous to its injection was a good preventive. Mr. Smith then gave an account of a troublesome explosion which had occurred in his retort-house, due to allowing the ground in the vicinity to become saturated with oils pumped out of the syphons.

Other subjects discussed were the desirability of supplying electric lights by meter, about which there was no disagreement, provided a suitable appliance could be met with, as the contract system led to extravagance on the part of consumers. Speaking as to the best burner for testing water gas, Mr. Lansden said a flat flame gave better results than a standard Argand. He would much prefer a 23-candle mixed coal and water gas to a 26-candle water gas. Mr. Greenough stated that his water gas gave better results with the Argand than with the flat-flame burner. Mr. Lamson agreed; and said that the State Inspector had recently proposed to substitute a flat flame for the standard Argand. Mr. Shelton preferred an ordinary batswing burner for testing the illuminating value of water gas or mixed gases.

NITROGEN IN "ACID SLUDGE" OF OIL-WORKS, CRUDE PETROLEUM, AND PARAFFIN OILS.

At a recent Meeting of the Liverpool Section of the Society of Chemical Industry, a paper treating on the utilization of the nitrogen in this waste product, by conversion into ammonia, was read by Mr. I. J. Redwood. To give an idea of the importance of this subject, it was stated that the total annual production from the Scotch oil-works was 37,000 tons; which according to theory should yield 6100 tons of sulphate of ammonia. The value of this would be more than ten times as much as the price realized for the refuse at present—3s. 6d. per ton. The refuse is of a thick treacly consistency; and contains about 50 per cent. of crude oily bases of the leucoline series. It was thought that these might be decomposed by superheated steam, and that the nitrogen set free could be made to combine with the hydrogen in the steam to form ammonia. As the sludge also contains an excess of sulphuric acid, it was mixed with an equal weight of "lime waste" (lime that had been used to causticize recovered soda), with a view of neutralizing the acid and preventing its action on the iron retort. The apparatus used consisted of a sort of retort setting, a cooling worm, and a small gasholder. The setting contained three cylindrical retorts, each 9 ft. 6 in. long by 6 inches diameter inside, having lids with cross bars and screws at each end. One of these only was used as a retort proper; the other two being packed with pieces of broken brick and used as contact chambers. By an arrangement of tubes and cocks, the gas generated in the retort could be passed through one or both of the contact chambers. These were arranged in a furnace after the fashion of a "bed of three;" and a wrought-iron coil was exposed to the heat for the production of the superheated steam, which was admitted to the gas at the inlet to the first contact chamber. From the contact chambers, the gases were conducted through a worm-tube immersed in water, which separated the tar and liquor. These passed off through a syphon overflow, and the gas was conveyed to the holder. The retort was charged with 10 lbs. of the mixture of sludge and lime waste at a time, which was allowed to remain in the retort for about 50 minutes.

In the first set of experiments, the apparatus was worked at a bright red heat, and the gases were passed through only one contact chamber. The average yield per 100 lbs. of the mixture was 700 cubic feet of gas, 25 gallons of ammonia water yielding 385 grains of sulphate per gallon = about 1·4 lbs. of sulphate, and 2·45 lbs. of neutral tar. In the second set of experiments, the apparatus was worked at a visible red heat, and the gases passed through two contact chambers. The average yield was 830 cubic feet of gas, 18¾ gallons of water yielding 575 grains of sulphate per gallon = 1·5 lbs. of sulphate, and 8·5 lbs. of neutral tar. In the third set of experiments, the heat was similar to the first, but both contact chambers were used. The result was 816 cubic feet of gas, 16¼ gallons of water yielding 670 grains of sulphate per gallon = 1·5 lbs. of sulphate, and 1·44 lbs. of neutral tar.

These experiments show that both a high heat and ample contact surface are necessary for the complete decomposition of the neutral tars. When the heat was the same, the yield of tar was halved by doubling the contact surface, as shown by comparing the first with the third set of experiments. The gas was sufficient to supply one-half the heat required in the furnace. Just at first it possessed considerable luminosity; but this gradually decreased until the last portions given off were quite non-luminous. In these experiments about 16 per cent. of the total nitrogen was recovered as sulphate. About half that quantity remained in the tar, a trifling proportion in the residue, and the remainder was assumed to pass off with the gas. Out of a total of 3·5 per cent. of nitrogen in the sludge, 0·65 per cent. was secured as sulphate. The specific gravity of the neutral tar was 1·129. It was wholly soluble in carbon disulphide; and

to the extent of 65 per cent. in naphtha. The portion insoluble in naphtha was nearly as solid, but not so brittle as pitch.

In concluding, the author remarked that the excess of acid might be neutralized by ammonia, which would cause the separation of the "sludge," and this could then be fed direct to the retort in a liquid form. It was evident that a retort and contact chambers of fire-clay, maintained at a nearly white heat, would effect the complete decomposition of the oily bases; but a suitable contact substance for promoting the combination of the nitrogen and hydrogen was wanted.

At a meeting of the Scottish Section of the same Society, a paper on the "Nitrogen of Crude Petroleum and Paraffin Oils" was read by Mr. G. Beilby. Referring to a former paper, the author said he had shown that the crude oil distillate from Scotch shale usually contained $\frac{1}{8}$ to $\frac{1}{4}$ of the nitrogen of the original shale. It contained 1·16 to 1·45 per cent. of nitrogen in the form of basic tars, which readily combined with, and were almost completely removed by, sulphuric acid of specific gravity 1·220; and these basic tars were the principal impurity of crude shale oil. The residue of pitchy coke from the re-distillation of crude shale oil contained about 3 per cent. of nitrogen. When the basic tars separated by sulphuric acid were neutralized and distilled, the percentage of nitrogen in the various fractions ranged from 3·24 to 3·54 per cent.; and the residue contained 4 per cent. of nitrogen, showing that the nitrogen tended to concentrate in the undistilled residue. Reference was also made to a statement in *Watts's Dictionary*, to the effect that while all crude oils or naphthas prepared artificially by destructive distillation of carbonaceous deposits contained nitrogen in the form of alkaloidal tars, the natural American petroleums do not contain any nitrogen. It might therefore be doubted whether they had been produced from organic deposits by any process of subterranean distillation.

The author had decided to carefully re-examine American and other natural petroleums for nitrogen; and he now gave the results of his observations. In the distillation of crude petroleum, the refiner takes off about 90 per cent. as distillate, leaving 10 per cent. of "residuum" in the still. This residuum contains the higher boiling oils, paraffin, and most of the tarry impurities. Unlike crude shale oil, it gave no separation of basic tars with dilute acids; but concentrated sulphuric acid separated a thick pitchy tar, quite free from the odour of pyridine bases that was so characteristic of shale tar. The "residuum" was found to contain 0·08 of nitrogen, equal to 0·008 per cent. of the original oil; and about one-half of this remained in the coke after distillation, and one-half was found in the thick tar. It was not thought that any appreciable portion of nitrogen would pass off with the 90 per cent. distillate. A sample of Russian crude petroleum contained 0·05 per cent. of nitrogen; and the residuum, which is in much larger proportion than in the former case, a similar quantity. Crude ozokerite from Galicia gave 0·188 per cent. of nitrogen; and some Scotch ozokerite, 0·296 per cent.

It was concluded that the smallness of these proportions of nitrogen could not be held to exclude American and Russian petroleums from classification as distillates from organic remains. As the natural distillation in the earth evidently produced much purer distillate, containing a smaller percentage of nitrogens and basic tars than that produced artificially. A coal, chiefly derived from the woody parts of large trees, would not give a distillate containing so high a proportion of nitrogen as a shale derived from animal remains, or the seeds and more highly nitrogenous parts of plants. It seemed evident that the much smaller percentage of nitrogen in natural, as compared with artificial oils, was due to the tendency of the nitrogenous bodies to concentrate in the residues of distillation. Any nitrogen converted into ammonia or volatile bases would, of course, disappear.

Mr. C. J. Lake has been appointed Secretary of the Stoke-on-Trent Corporation Gas Committee, in succession to Mr. E. Roberts.

Death of Mr. W. Agate.—The death is announced, in his 60th year, of Mr. W. Agate, a Director of the Clacton-on-Sea Gas and Water Companies.

Deaths from Inhaling Illuminating Gas in the United States.—The total number of deaths caused by inhaling illuminating gas in the United States last year was 174; but it appears that 35 of these were cases of suicide—leaving 139 which are supposed to have been accidental. Of these, one happened where oil gas is made, six where only coal gas is used, 49 in places where there is only water gas, and 83 where there are both coal and water gas works—the gases being usually mixed.

The Bilston Water Supply Question.—The Bilston Improvement Commissioners have lodged in the House of Lords an appeal against the decision of the Court of Appeal in the action brought by the Wolverhampton Corporation to restrain the Commissioners from taking steps to supply their district with water from any other source than the Corporation. The case was reported in the JOURNAL a fortnight ago (p. 650); and it may be remembered Lord Justice Kay dissented from Lords Justices Lindley and Bowen in giving judgment for the Corporation. This fact has doubtless influenced the Commissioners in seeking the opinion of the highest tribunal.

REGISTER OF PATENTS.

Manufacture of Illuminating Water Gas.—Williams, H., of Stockport. No. 5434; April 10, 1890. [11d.]

This invention relates to apparatus for generating gas composed of a combination of hydrogen produced from the decomposition of superheated steam, with carbonic oxide, carbonic acid, gas produced by the distillation and carbonization of coal or wood, and gas produced from liquid hydrocarbons; the object being to render the combination into a fixed or permanent illuminating gas. When, however, illuminating gas is not desired, the arrangement and construction of the apparatus is capable of producing each of the gases alone—or in any combination necessary for manufacturing purposes.

Fig. 1.

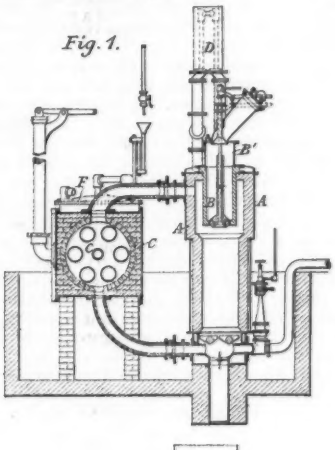


Fig 2.

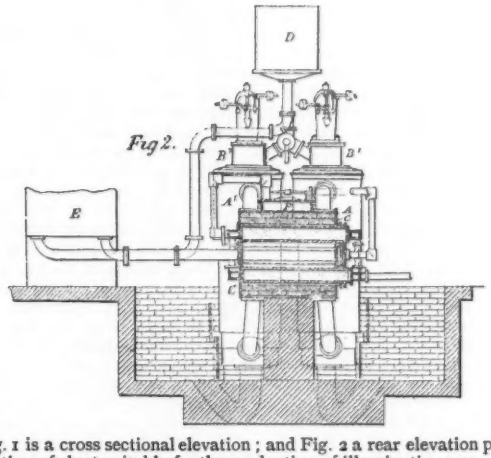


Fig. 1 is a cross sectional elevation; and Fig. 2 a rear elevation partly in section of plant suitable for the production of illuminating gas.

A A¹ are the two gas producers; B is one of the distilling retorts; C is the fixing retort chamber; D is the condenser; E is a scrubber or purifier; and F is the carburetter. Each producer has an outer metal shell lined with fire-brick, as usual; and each one is provided with a set of rocking grate bars, actuated from the exterior of the furnace by hand-levers—the ashes from the grate falling into a syphon trough, from which they can be withdrawn at intervals without interfering with the supply of air to the producer. When the apparatus is at work, each producer is partly filled with incandescent fuel; and it is fed from a retort B with which each one is provided. These retorts are charged through their hopper mouths provided with valves which open downward toward the retorts, and with stoppers or a second valve, whereby the mouths of the hoppers can be closed. When each hopper has been charged with small coal, the mouth of it is closed, and the valve is lowered, so as to discharge the coal into the retort. The coal is retained within the retort by a valve of cast iron or of refractory material, and carried by a spindle, which passes through the hollow spindle of the mouthpiece valve. When the coal has been sufficiently carbonized by the heat of the producer and of the issuing gas (as will be hereafter explained), the coke is discharged into the producer. The valves are operated by hand-levers loaded so that during the ordinary working they are kept in their upper or closing positions. Each producer is connected with the chamber C by two pipes or gas passages; the one connected with the upper part of the producer, and the other with a closed chamber below the fire grate of the producer. These pipes are lined with refractory material, and are each fitted with a sliding-valve.

The chamber C has a fire-brick lining and an outer metal casing; and it contains seven retorts. The central retort is for re-heating the gas and the six others are for "fixing" the gas after it has been charged with hydrocarbon. These latter retorts are charged with small pieces of iron. The chamber is provided with a chimney (for the escape of gases at times when they are not being passed from one producer to the other, as hereafter explained) arranged with a damper or valve, which can be readily opened and closed by a lever as in ordinary arrangements. The carburetter F is mounted on the top of the chamber C so as to receive heat therefrom. It consists of a chamber provided with partitions so arranged as to compel the gas, when passing through, to take a circuitous course. Gas is led into it through a pipe

communicating with the outlet end of the re-heater; while the outlet-pipe communicates by coupling pipes with the inlet ends of all the "fixing" retorts—the outer ends of these retorts being coupled with a pipe to convey the finished gas to a holder. Each producer is also connected with the condenser D by means of a branch from a hood B^1 or B^2, which covers the mouth of the retort B. These branches are connected by a three-way valve with an ascension-pipe, which conveys the gas to the condenser. This valve is so constructed that either of the hoods B^1 or B^2 may be placed in communication with the condenser; the other hood being shut off so that the producers may be alternately put in communication with the condenser. The condenser is so arranged that the pipes and the passages allow all the tar and liquid matters resulting from condensation to flow back into the retorts B. The gas travels from the condenser to the purifier E, which is of ordinary construction; and from the purifier, it passes to the inlet end of the re-heating retort. Air under pressure can be supplied to the space below the grate of the producer by means of a pipe in connection with a blower, and provided with valves so that the air can be admitted into either or both the producers. Air can also be forced into the same space by a steam injector; means being provided for regulating the inlet of air so that more or less steam may be caused to accompany it, and also that at times steam alone may be passed into the producer. In the example, a revoluble "hit-and-miss" air-valve is applied. The carburetter is supplied with liquid hydrocarbon by means of a drop pipe, which discharges into a syphon-pipe for conveyance into the carburetter.

When starting the apparatus, fires are lit in the two producers; and they are fed with coke through the hoppers, the valves of which are lowered to permit the fuel to fall into the producers. Air to support combustion is blown in during the preliminary heating of the apparatus; both valves and the damper being open. The gases pass into the chamber C, into which air may be admitted to support combustion.

When the producers are charged with incandescent fuel and the retorts are highly heated—say, to a red heat or a little below—the production of gas is commenced. To prepare for this production, the retort B in each producer, or in one to commence with—say, in the producer A^1—is charged with coal or other bituminous or gas-producing fuel; the damper being closed and the supply of air to the producer A shut off. The hydrocarbon liquid is then permitted to drip into the carburetter, and the valve turned to connect the producer A^1 with the condenser. Operations are now commenced by opening the air-valve and the steam-cock of the injector, whereby air and steam are forced through the incandescent fuel in the producer A. The resulting gases pass in a highly-heated state into the chamber C, and from this chamber into the space below the grate of the other producer A^1. Steam is blown in to pass through the fuel along with the gases from the chamber C. The fuel in the producer A^1 should be in a state of high incandescence. The gases pass upward through the fuel in this producer, and through holes in the valve into and through the retort B to the condenser. This retort will have become heated; and the gases will be passing off to the condenser. The highly-heated gases flowing from the producer through this retort aid in the carbonization of the charge in the retort; the gases given off mingling with the gases from the producer. The tar and other matters flow back from the condenser, and are carbonized in the retort; any matters failing to be so carbonized passing into the producer, so that ultimately all the fuel is converted into gas and ashes. From the condenser the gases flow to the scrubber or purifier E, and thence to the "re-heater" retort, through which it flows, and becomes heated so that it may be in a better condition to take up the hydrocarbon. Passing into the carburetter, the gas travels through it, and takes up the vaporized hydrocarbon. Leaving the carburetter, the gas passes into and through the "fixing" retorts, and is thereby brought into close and intimate contact with a large surface of heated iron, which has the effect, it is said, of "rendering the combination of gases and of carbon stable, so that the gas can be kept in holders and be conveyed in distributing-pipes without losing its illuminating power. The treatment in the retorts also improves the quality of the gas by decomposing any remaining water which it may contain, and by absorbing free oxygen if there be any present."

After the production of gas has continued for a time, the heat of the fuel in the producer A^1 becomes reduced. The valves are now altered so that the air is blown into the producer A^1; and so that the gases from this producer pass through the chamber C and upward through the producer A. A short working under these conditions, will, of course, have the effect of restoring the heat of the fuel in the producer A^1. By thus altering the valves at intervals, the two producers are kept in working order for some time; but after a period the steam which is blown into the producers will have dulled the fires to such an extent that it will become necessary to revive them. At suitable intervals therefore, the production of gas is stopped, the steam is shut off, and air alone is admitted below the grates so as to blow up the fires; the highly-heated gases passing into and through the chamber C, and escaping by the chimney so as to restore the heat of the chamber and its retorts.

Gas Motor Engines.—Lanchester, F. W., of Bedford Row, W.C. No. 5479; April 10, 1890. [8d.]

This invention consists in introducing into the working cylinder of a gas-engine while the piston is stationary inflammable gas or vapour so as to force out a portion of the air contained therein, and mix with the remaining air until an explosive mixture is formed. Also in providing means whereby, on cutting off or reducing the supply of inflammable gas or vapour, the mixture is exploded to start the engine; and whereby, when the engine is running, explosive charges in the cylinder at atmospheric pressure are ignited at the commencement of the working strokes, and when required in compression engines (after starting the engine from rest) in keeping the pressure of the explosive charges in the cylinder approximately that of the atmosphere until the engine has attained sufficient speed to overcome the resistance of compression, so that they can be exploded at the commencement of the working stroke by this device.

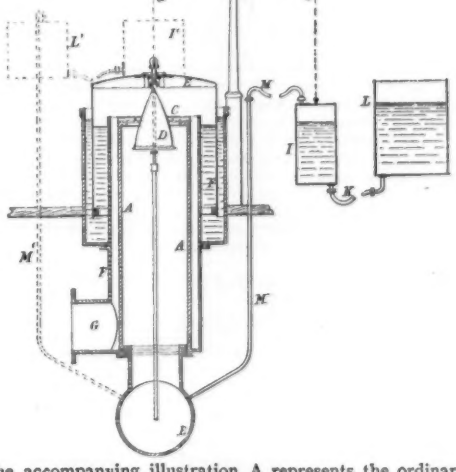
In a gas-engine of the "Otto" type provided with a starter constructed according to this invention, the compression chamber is fitted with an attachment communicating with the chamber, and terminating in an expanding nozzle opening to an external flame. This attachment can be permanently closed by a cock, and contains a valve which normally remains open by its own weight, but will automatically close by the sudden generation of pressure in the cylinder.

In order to start an engine fitted with this device, the engine is placed (or it may have been stopped at its previous working) in such a position that its crank is somewhat over the in-centre of the working stroke. The external flame of the starter is then lighted; and the gas or inflammable vapour is turned on to or forced into the working cylinder through a nozzle. It first displaces a portion of the air contained in the cylinder, which passes out through the nozzle of the starter; and then a continuously increasing proportion of gas or vapour flows out with the air until it burns with a characteristic roar in the expanding nozzle. The auxiliary gas supply is then cut off or reduced; and the flame passes back into the cylinder, and burns or explodes the charge to increase its pressure to start the engine. The automatic valve in the starter closes immediately on the explosion; and the cock of the starter is then turned to put it out of action, by cutting off communication with the cylinder, so that the engine continues to work in the ordinary manner.

A relief cam, which keeps the exhaust port open during more or less of the compressing stroke (as is frequently used to facilitate hand-starting), may be used in compression engines, to enable the impulse given by the initial charge to overcome with certainty the back pressure of the compression. In another arrangement, a relief cam is arranged to keep the exhaust port of the cylinder open until the piston has completed its compressing stroke. The engine is started as described above; and, after exhausting the products of the first explosion, it draws in a fresh charge, a portion of which on the return or compressing stroke is forced out through the exhaust port and through the nozzle of the starter. As soon as the piston pauses on the crank crossing its centre or commences its working stroke, the explosive mixture ceases to pass through the nozzle of the starter, or reduce its rate of passing through; and the flame then passes back into the cylinder and explodes the remaining portion of the charge therein. A series of explosions may be obtained in this manner. When the engine has attained a sufficient speed to overcome the resistance of compression, the auxiliary cam and the starter are thrown out of action, and the engine works in the ordinary manner.

Gas-Governors.—Beechey, C. G., of Liverpool. No. 5853; April 17, 1890. [8d.]

This invention has special reference to the governors placed between the holders and the outlet main from the gas-works to the town or district.



In the accompanying illustration, A represents the ordinary inner chamber of a gas-governor, in communication at the bottom with the inlet B from the holder; and it has at the top an outlet C with a valve D suspended from the inside of the bell E, which forms a communication between the outlet C and the outer chamber F, to which the main G to the town is connected. The bell E with the valve D is suspended from a counterbalanced beam H. These parts are, it will be seen, of ordinary construction or arrangement. The object of the present invention is to automatically increase or decrease the pressure of the gas at the outlet from the governor in proportion to the quantity of gas delivered. For this purpose on the counterbalance end of the beam H, a vessel is placed such as shown at I, connected by means of a flexible pipe K to a water-tank L. Consequently as this counterbalance vessel rises or falls, the water will run out of or into it; and thus vary its weight according to its position relatively to the tank.

The action of the apparatus is as follows: As the consumption of gas increases, the bell E will fall as usual, and open the cone or valve D wider, so as to allow more gas to pass. The counterbalance vessel I will consequently rise; and the water will run out of it into the tank, and it will become lighter. Thus, by diminishing the counterweight to the bell E, it will increase the pressure at the outlet G. In other words, the pressure at the outlet G is increased or decreased in proportion to the increase or decrease of the area round the cone or valve D—that is, in proportion to the quantity of gas delivered at the outlet G. In order that the governor may act perfectly, the cone or valve should be so shaped that each inch or degree of fall will give an equal increase of area; or the same object may be obtained by making

the counterbalance vessel I conical, so that the weight of water per inch shall vary in proportion to the variation in the area of the cone or valve.

A governor constructed as above described will work well (says the patentee) so long as the inlet pressure is constant, and a given quantity of gas passes the cone D in proportion to the area of the passage it forms. In gas-works, however, the inlet pressure is subject to variation on account of the supply to the governor being changed from one holder to another, and also because, as the holder gradually empties and falls, the pressure is reduced—especially with holders of the telescopic class. If a governor constructed as described were working with an inlet pressure of (say) 4 inches, a certain quantity of gas would pass the space provided by the cone D. If, however, the inlet pressure were increased to 8 inches, twice the quantity of gas would pass unless the cone D rose and reduced the area. But as the cone would rise, the counterbalance vessel would fall; and the water would run into it and make it heavier, and consequently take weight off the bell. The outlet pressure would thus be reduced; and therefore the pressure would not be in proportion to the amount of gas delivered at the outlet of the governor. In order to obviate this, the top of the counterbalance vessel is closed, and connected with the inlet B to the governor (or with some point between the holder and the governor) by means of a flexible pipe M. The effect of this is that, as the inlet pressure increases, the pressure on the top of the water in the counterbalance vessel increases, and so tends to force the water out of it into the tank L. But since, as already explained, the cone D will rise by the inlet pressure, and consequently the counterbalance vessel descend, the head of water will be increased; and thus, by properly proportioning the capacity and movement of the counterbalance vessel, it is clear that although this vessel will fall, the water will be prevented from coming into it by the increased pressure acting on the top of the water—that is to say, the closing of the cone D due to an increase of pressure at the inlet B, will not cause the weight upon it to be altered, because the increased inlet pressure will also act upon the water in the counterbalance vessel; and thus counteract the tendency of the water to flow into this vessel. Its weight will thus remain the same, although its position relatively to the water-tank has been changed.

The arrangement can be reversed in its action by placing the counterbalance vessel on the top of the bell E as shown in dotted lines at I^1, closing the top of the tank as at L^1, and connecting this with the inlet pressure as indicated by the dotted pipe M^1. In this case, weight will be actually added to the bell E, in order to increase the pressure, instead of weight being taken off the counterbalance, which is the same thing. With this modification, the bell E should be counterbalanced in the ordinary manner.

Guiding Gasholders.—Livesey, G. T., of the South Metropolitan Gas Company, Old Kent Road, S.E. No. 6269; April 24, 1890. [11d.]

The object of this invention is to provide means or apparatus whereby the tilting of shallow gasholders may be prevented. "In gasholders having the ordinary guiding apparatus" (says the patentee) "it is considered necessary, for safety in working, to make them of a depth not far short of one-fourth, or one-fifth of their diameter. For very large gasholders, this necessitates the construction of very deep and consequently expensive tanks, especially where they have to be built in water-bearing strata. Thus for gasholders of 250 or 300 feet in diameter, tanks of 50 or 60 feet deep are desirable; but by means of this invention, exceedingly shallow gasholder, with many lifts, can be safely worked. The invention is not intended to entirely supersede the use of ordinary guide-framing and rollers, but only to keep the inner lifts level until one or two of them are cupped, when their combined depth becomes sufficient to maintain the holder level by means of the ordinary guide-rollers."

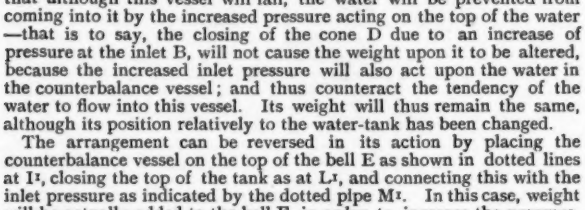
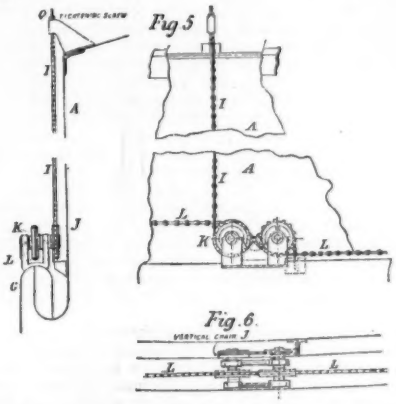
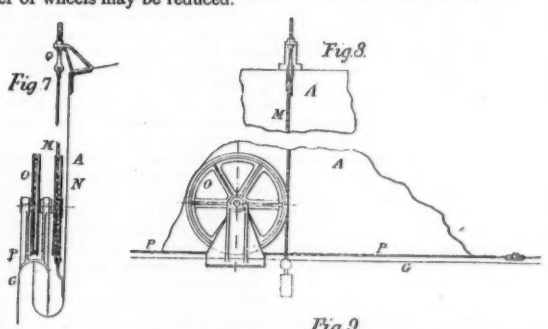


Fig. 1 is a transverse sectional elevation of the side of part of two lifts of a gasholder, fig. 2 is a front elevation, and fig. 3 is a plan—all when a rack, wheel, and pinion arrangement is adopted. Figs. 4, 5, and 6 are similar views, when a pitch chain and wheel system is applied. Figs. 7, 8, and 9 are similar views, when wire ropes and wheels are employed.

For the purpose of carrying out the first arrangement, there is fixed vertically upon the sides of the gasholder A a series of toothed racks B, which extend from the top to the bottom of the holder to be supported. At or near each rack, mounted in suitable supports attached to the grip or inverted cup of the next lower lift, is a short shaft or spindle C, which carries a toothed wheel D and a pinion E. The toothed wheel is made to gear into the rack B, while the pinion E gears into a rack F that is placed horizontally on top of the grip G, and either extends round the whole circumference of the lift, or may be made in a series of segments—each segment being connected to the next one by a rod, bar, or other suitable arrangement. The rack, whether made continuous or in segments, is supported upon and guided by rollers H, and so is free to revolve round the holder upon motion being applied to the pinion E. It will thus be seen that in working, one side of the lift cannot rise or fall without a corresponding rise or fall on the opposite one. In other words, motion imparted to any one part of the holder is necessitated in all the other parts in an equal degree.



In the second arrangement, in lieu of racks, pitch chains and wheels (something like those employed in bicycles) are used. In this case there is fixed at suitable intervals round the holder a series of chains I; one end of each being fastened to the top and the other to the bottom of the lift. These are caused, by a guiding roller or other suitable means, to gear into a toothed wheel J, attached to the top of the grip G of the next lower lift. On the spindle of the wheel is keyed another similar wheel K, with a similar chain L passing over and kept in gear with it; this chain extending the whole circumference of the holder, and being continuous, or made in parts connected together by rods or other suitable means. In a modification of this plan, by the adoption of suitably placed guide rollers of appropriate size, the number of wheels may be reduced.



In the third arrangement a number of wire ropes M are fixed to the top and bottom of the lift. Each rope in descending passes round, and gives motion to a flanged wheel N mounted upon the top of the grip G of the next lower lift. Round another similar wheel O, keyed to the same shaft as the first one, a rope P, extending the whole circumference of the holder, is made to pass and serve the same purpose as that of the pitch chain and horizontal rack before referred to. The working of the two latter arrangements are identical with that described with reference to the first one. For the purpose of keeping the chains or ropes sufficiently taut, tightening screws Q, or any other suitable device, may be employed.

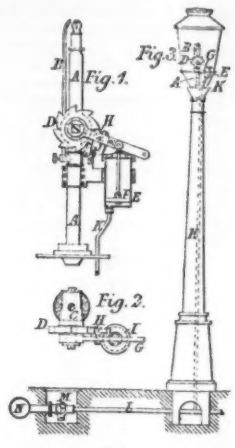
Automatically Lighting and Extinguishing Gas-Jets.—Thompson, W. P.; communicated from M. Defraigne, of Paris. No. 7507; May 14, 1890. [8d.]

The object of this invention is to allow of the immediate extinguishing or lighting automatically of any number of gas-jets; the operations being controlled from a point more or less distant from the jets. It is based essentially on the use of compressed air (or of vacuum) as an intermediate agent between the apparatus for lighting or extinguishing, placed close to the gas-jets, and the handle or tap fixed at the place from which it is desired to simultaneously bring about the lighting or extinguishing of the jets.

For this purpose each of the jets is fitted with a pilot burner; and the tap of the burner proper is actuated by the piston of a small air cylinder situated near the jet, and communicating with a special series of pipes, which a single three-way cock allows of being instantaneously put in communication, either with the external air, with a reservoir of compressed air, or with a vacuum reservoir, according to whether one or the other of these intermediate agents of transmission is employed.

Fig. 1 is an elevation of the device, with fig. 2 as a plan view of the tap and air cylinder actuating it. Fig. 3 shows the arrangement of pipes for compressed or rarefied air applied to a street gas-lamp.

The tap of each jet A is made with four ways—that is to say, its plug C is perforated with two passages placed at right angles; and on this plug a ratchet wheel D, with eight teeth, is fixed. Under these conditions, if the plug C be (for instance) in the position allowing the passage of gas, as soon as the rachet wheel D is moved one tooth forward,



the tap will be closed, and, by moving it forward another tooth, it will be again opened, and so on—since the number of teeth in the ratchet is double that of the openings in the box to which it is attached. Further, on the jet or on its support, a small cylinder E is fitted, in which a piston F moves, the rod of which works a pivoted lever G fitted with a spring pawl H, arranged so as to act on the teeth of the ratchet. The cylinder is closed at its upper end by a cover I, which, while allowing free access of the outside air, limits the travel of the piston, so that it corresponds exactly to the displacement of one tooth of the ratchet wheel. Finally, on the gas-jet, or on the part to which the cylinder is attached, a check pawl J is mounted, which holds the ratchet wheel (and, consequently, the plug of the tap) in the position to which it is turned, and which prevents it shifting back during the return movements of the lever G and its pawl. It is obvious that, under these conditions, every time the piston may be raised, the plug will be forced to make one-eighth of a revolution—that is to say, to pass from its closed to its open position, and *vice versâ*.

In order to produce the successive movements of the rotating gas-tap, the bottom of the cylinder E communicates freely with a tube K branching at its lower end from the principal pipe L, which leads from the point from whence it is desired to actuate the tap. This station is fitted with a three-way valve or tap M, branching from a main-pipe N, or from a reservoir filled with compressed air, the use of which will be shown later. At the upper part of the gas-jet, a branch-tube B terminates, which serves as a pilot light, in which the lighting can be produced by the simple fact of opening the inflow tap for the gas.

The apparatus thus arranged works in the following manner: Presuming that the tap of the gas-jet is closed, and that it is desired to light up, it will be sufficient to turn the three-way cock M, fixed at the station, so as to allow the compressed air contained in the reservoir N to flow into the pipes L, and act on the pistons F in the cylinders E placed near the jets. Under this action, the piston of each cylinder when rising will force the ratchet wheel D (and, consequently, the tap of the corresponding gas-jet) to turn one-eighth of a revolution. The tap, being then open, will allow the gas to reach the burner, where it will be lighted by contact with the flame of the pilot B. This operation terminated, the three-way cock governing the system of pipes is again turned, so as to place the former in communication with the external air; and the piston of each cylinder E being no longer supported by the pressure of the air, descends under the action of its own weight. The pawl on the lever G, which is actuated thereby, slides over a tooth of the ratchet, which remains held in position by the check pawl J, and the apparatus is then again ready to receive a fresh impulse. When the second impulse is given, by again allowing the compressed air to enter the pipes, the plug E of each gas-jet will make one-eighth of a revolution, and thus achieve the closing of the corresponding cock; and the jet will be immediately extinguished. The parts will then resume their normal position, as before, as soon as the pipe L is put in communication with the external air.

Treating Liquid Hydrocarbons.—Stringfellow, J. H. W., of Walthamstow. No. 14,832; Sept. 19, 1890. [6d.]

The objects of this invention are twofold—"To provide a practicable and improved method of solidifying liquid hydrocarbons, so as to obviate the danger and expense now attending their carriage and storeage for use; and to provide a material for generating light, heat, power, and other purposes, in which water is incorporated with hydrocarbons in varying proportions, as desired."

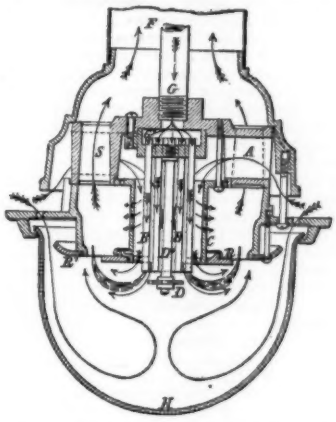
The patentee proposes to take a saponifier, preferably of the nature of quillaia saponaria bark, and pulverize it. Of this powder, a certain quantity, in its normal dry state, is introduced into the vessel containing the liquid hydrocarbon; the amount used depending upon the gravity of the hydrocarbon, and the purpose for which it is required. If a volatile oil is to be treated, quillaia saponaria powder, equal to say 1 per cent. of the hydrocarbon, is agitated with it, so as to thoroughly distribute the saponifier throughout the liquid. After this, water, as necessary (sometimes, say, equal to 10 per cent. of the hydrocarbon liquid), but sometimes considerably more, is added. When the water is added, it is, by any suitable means, intimately mixed with the hydrocarbon, the result of which is that the water, "acting chemically upon the distributed particles of the saponifier, and this re-acting upon the hydrocarbon, solidification is set up, and the whole is quickly reduced to a gelatinous state." The operation is said to be so rapid, with proper appliances for pulverizing the saponifier and mixing the materials, that it only occupies a fraction of the time necessary to effect the operation by the method of preparing and using a liquid extract of saponifier, even supposing the latter method was commercially practicable.

The liquid hydrocarbon and water thus solidified or gelatinized, forms a product or combination, which is claimed as being highly valuable for many purposes. While heated in the act of burning, it does not flow; and besides this, "the oxygen and hydrogen, the component parts of the water being decomposed, are potential auxiliaries in the combustion of the hydrocarbon."

When it is required to reliquefy the gelatinous or solidified material, in order to prepare the hydrocarbon for use in a liquid form, the solidified material is treated, in a water-tight vessel, with acetic or other acid, poured on to the surface of the mass, so as to completely cover it. The proportion of acid necessary for producing reaction is not more than 2½ per cent. of the solidified hydrocarbon. After standing for a few hours, according to the vessel used and the material acted upon, the acid "will cause the saponaria and water to separate from the hydrocarbon, and precipitate to the bottom of the vessel; thus leaving the liquid hydrocarbon free to be used or drawn off as required."

Regenerative Gas-Lamps.—Siemens, F., Queen Anne's Gate, Westminster. No. 7521; May 14, 1890. [6d.]

This invention relates to regenerative gas-lamps of the kind in which a nearly horizontal flame extends from the middle outwards and then upwards; the products of combustion ascending to a chimney by channels which are crossed by other channels admitting to the flame a supply of air heated by conduction through the walls of those channels.



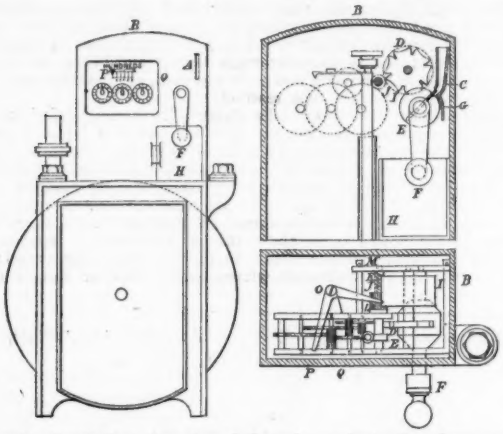
In the illustration, G is the gas-pipe supplying a chamber G^1, whence descend a number of tubes B circularly arranged. The upper ends of the tubes extend a little above the bottom of the chamber G^1, so that they are not liable to become obstructed by deposited matters that may descend the pipe G. A little below the lower ends of the tubes B is a deflecting button, disc, or star D, carried by a central rod D^1 extending down from the bottom of the chamber G^1. The central air passage C terminates at the bottom with an internal flange C^1 having holes through it for the passage of the tubes B; and outside each of these tubes is a hole for the passage of air. At the lower end of C is (loosely supported) a porcelain ring R, preferably slit across at one part to relieve it from strains resulting from expansion and contraction that might otherwise crack it. It constitutes a reflector above the flame; while another porcelain ring R^1 does similar duty outside the flame. The products of combustion pass up the chamber S to the chimney F; and air, which enters by cross channels A, becomes heated and descends within the central casing C to supply the flame. Some additional air may be made to enter by apertures round the glass holder into the interior of the globe H, and, sweeping round therein towards the flame, keep the globe cool. The wall C of the central air channel may be perforated with a number of holes, through which some of the air from the central channel can enter the passages for the products of combustion, and keep the walls of these passages from becoming overheated.

Coin-Freed Gas-Meters.—Glover, S. and T., and Critchley, J., of St Helens. No. 470; Jan. 10, 1891. [8d.]

This invention relates to apparatus for controlling or determining the delivery of a quantity of gas for which pre-payment has been made through a coin-operated device. The meter is so arranged that the coin is passed through a slot, and enters an opening in a drum not sufficiently deep to permit the coin to be contained altogether within it. One edge therefore projects and forms a temporary tooth, which, upon rotation of the drum, engages with a scallop or similar wheel, and imparts a partial rotation thereto, and afterwards, by the continued rotation of the drum, falls into a till or receiver. Upon the scallop wheel spindle is mounted a wide spur-wheel engaging with a spur pinion, which has a screwed eye, and mounted on a screwed spindle parallel with the spur wheel spindle. The rotation of the drum with the coin therein, causes the rotation of the scallop wheel of the spur wheel and of the spur pinion. The spur pinion having a screwed eye, and being mounted upon a screwed spindle, moves helically thereon, through a distance determined by the number of teeth in the scallop wheel, by the ratio of the number of teeth in the pinion to the number of teeth in the wide spur wheel, and by the pitch of the screw. The other end of the screw spindle carries a wheel, which engages with the ordinary counting mechanism of the meter.

The illustrations [see next page] show a front elevation of a meter provided with these improvements; and a vertical section and a plan thereof.

Assuming that the coin to be employed is a penny, it would be inserted through the slot A, formed in the front side or top of the casing B, whence it falls by gravity through the channel C into a longitudinal slot formed in the periphery of the drum E. The slot is



of such a depth that the edge of the coin projects therefrom, so that it may engage with the spaces in the scallop wheel D and effect its partial rotation when the drum is turned. The axis of the drum is produced through the front of the casing, where it is fitted with a handle F, by means of which the drum may be turned. Alongside the drum there is fixed a stop G, with which, if the drum is attempted to be turned in the wrong direction (that is to say "clock-wise"), the edge of the penny would come into contact, and prevent the rotation. In case the coin, after having operated the scallop wheel, should not fall out of the drum into the till or receiver H, this stop also prevents the further rotation of the coin drum, and thus renders it impossible for the scallop wheel to be twice moved by the same coin.

The teeth of the scallop wheel, or the parts between the spaces in which the coin engages, are formed concave to fit upon the periphery of the drum with which it is in contact. Consequently the wide spur wheel I and the pinion J engaging therewith cannot possibly be rotated, except by the rotation of the handle F, when a penny is contained in the drum slot, since the spur wheel I and the scallop wheel are both fixed upon the same spindle. Also as the screwed spindle K upon which the pinion J is mounted can only be rotated by the counting mechanism of the meter, it follows that, when a coin is inserted and the drum is rotated by the handle, the pinion J (being thereby rotated upon its screwed axis) will move laterally through a distance determined by the number of teeth in the scallop wheel, spur-wheel, and pinion, and by the pitch of the screwed spindle respectively. These numbers and dimension will in all cases be determined by the price at which the gas is sold; but, in practice, it is preferred to have the scallop wheel and the screwed spindle constant, and to provide for differences in the price of the gas by altering the ratio between the wide spur wheel I and its pinion J. To readily effect this, it is preferred to secure the spur-wheel to a flange fixed upon its spindle.

The pinion J at the end of its travel upon its screwed spindle comes into contact with the collar or stop L. Because this pinion cannot be rotated except through the handle as already described, the further rotation of its screwed spindle is prevented; and because also this screwed spindle is geared directly with the counting mechanism and to the drum of the meter, the action of the meter will be stopped, and no more gas can pass through it until the pinion has again been moved out of contact with the stop L.

The action of the apparatus is as follows: A penny having been dropped into the coin drum, the handle is moved through one revolution. This motion is translated through the scallop wheel and wide spur-wheel into a helical motion of the pinion along its spindle through a certain distance; and the total motion of the pinion along its shaft will be directly proportionate to the number of pence prepaid—the handle and coin drum having had one turn given to them for every penny inserted. The gas being now turned on, the drum of the meter, by its motion, will rotate the screwed spindle of the pinion J, until the pinion travelling thereon as a nut has returned into contact with the stop L, and further motion of the meter drum is thereby arrested—the amount of gas paid for having been supplied.

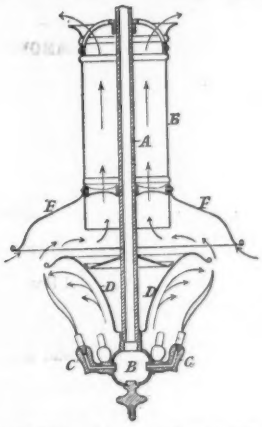
It is obvious that any number of pence (within the limits of the apparatus) can be successively inserted, or that a single penny or a number of pence can be inserted at any time without waiting for the supply previously paid for to be exhausted, and that the actual amount paid for will be delivered. Further, by providing a stop or collar on the screwed spindle at M, so as to limit the motion of the screwed pinion in the opposite direction to the stop L, it will be evident that, when a penny is inserted beyond the full number of pence for which the apparatus will receive prepayment, the additional penny cannot rotate the apparatus until part of the gas already paid for has been consumed.

A device may be added to the apparatus for the purpose of indicating what quantity of gas has been paid for, and what quantity remains unconsumed. This consists of the bell-crank lever O, one end of which engages with a groove turned around the pinion J, and the other end of which is provided with a pointer P, which moves over the index Q in front of the casing.

The apparatus has thus been described as applied to an ordinary wet meter; but it may with equal facility be applied to a dry meter. The screwed spindle K will merely need to be geared with the worm which actuates the counting mechanism in each case, or with the counting mechanism itself, so that the action of the meter is stopped when the pinion J comes into contact with the stop L.

Gas-Lamps.—Cowan, T. W., of Rotherham. No. 845; Jan. 16, 1891. [8d.]

The lamp constructed according to this invention has two or more burners, preferably flat-flamed and inclined radially from a central gas chamber. The inner sides of the flames are supplied with air heated by passing in contact with a deflector placed close behind and above, and so arranged as to be heated by radiation from the flames, and by the products of combustion. The air thus supplied to the inside of the flames is itself highly heated; and it causes the flames to expand and burn with great brilliancy and steadiness. The deflector also acts as a reflector. The illuminating power can be intensified, and increased steadiness imparted to the flames, by collecting the products of combustion in a wide-mouthed baffled chimney or flue; thus causing the heated products to pass over (or through) the upper side of the deflector. The heated condition of this deflector causes it to be self-cleaning, as all carbonaceous matter is consumed as deposited. By a slight modification, and by placing an ordinary ventilating shaft above the chimney, the lamp forms a ventilating gas-light.



The illustration represents, in vertical section, a lamp having six burners. A is the pipe leading to the gas chamber B, from which project the sockets C, carrying the burners, which incline outwards and upwards. D is the deflector; E, the chimney or flue; and F, the flue mouth or collector. The deflector is supported on the rim of the chamber B by a disc; and it extends along at the back of the flames, and up over them. The deflector and the chimney base may, however, be made to meet, with holes in it for the passage of the air and products of combustion. The lamp will then act as a ventilator, if the chimney be led to the outside of the apartment in which the lamp is used.

APPLICATIONS FOR LETTERS PATENT.

5907.—Siemens, F., "Improvements in regenerative gas-stoves." April 6.

6044.—Brook, E., "Improvements in or pertaining to furnaces heated by gas." April 8.

6086.—Tee, T., "Improvements in or connected with the lighting and extinguishing, or controlling the light of, street and other lamps." April 9.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by correspondents.*]

Prizes for Inventions.

Sir,—I ventured some years since, at Southampton, to call the attention of gas companies to the desirability of offering two handsome prizes for the following objects: First, for the complete purification of gas from sulphur; secondly, for a thoroughly good domestic burner—the conditions for the latter to be defined.

I purposely refrain from saying more than this, that if such views would find a ready and hearty response, I should be very glad to co operate with others in this matter.

Exeter, April 14, 1891. W. A. Padfield.

Walker's Over-Ground Gasholder-Tank.

Sir,—In the Journal for April 7, Mr. Marshall invites attention to the dangerous system of constructing gasholders with storeage spaces under the tanks. After stating that Messrs. C. and W. Walker have recently patented a structure similar to Professor Intze's plan, he concludes with these words: "It is curious to see English engineering firms slowly awakening to the advantages of the system; but it is still more curious to observe the calm manner in which Professor Intze's patent is ignored."

It is only fair to "English engineering firms" to state that this system of construction is, after all, an English invention, and has not been pirated from abroad. No less than thirty years ago, Mr. Frederick Gye obtained a patent for the identical thing. His patent specification is entitled "Improvements in Constructing Gasometers and Gasometer Tanks." (No. 2075, Aug. 20, 1861.) On April 12, 1862, an article appeared in the *Builder* entitled "Gye's Gasometers and Tanks," describing the invention; and only last year a reprint of this article appeared in the Journal for Aug. 12 (page 350). Under these circumstances, I cannot see that Professor Otto Intze is more entitled to a patent than Messrs. Walker—more especially as the invention originated in England and not on the Continent.

As regards the "advantages of the system," I may say that immediately after reading Professor Intze's communication to The Gas Institute, in 1885, I wrote an article setting forth the *disadvantages* of the system. But after I had completed the paper, it appeared to me that the objections to the construction, although serious, must be so obvious, that it was never sent for publication

April 13, 1891. F. S. Cripps.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

The following progress was made with Private Bills last week:—

Bills brought from the Commons, read the first time, and referred to the Examiners: Bognor Water Bill; Fylde Water Bill; Garw and Ogmore Gas Bill; Leighton Buzzard Gas Bill; Market Drayton Water Bill; Western Valleys (Mon.) Water Bill.

Bill committed to a Select Committee, consisting of Lord Brassey (Chairman), the Marquis of Abercorn, Earl Winchilsea and Nottingham, Earl Lucan, and Earl Ravensworth; to meet on Thursday, April 23: Kettering Gas Bill.

HOUSE OF COMMONS.

The following progress was made with Private Bills last week:—

Bills read the first time: Electric Lighting Provisional Orders Bills (Nos. 1 to 4), to confirm Provisional Orders made by the Board of Trade in reference to Acton, Bolton, Bishop's Stortford, Canterbury, Chiswick, Coventry, Croydon, Dewsbury, Ealing, Hanley, Harrogate, Heckmondwike, Kidderminster, Llanelly, Londonderry, Norwich, Southend, Southport, South Shields, Stockport, Sunderland, Surbiton, Tynemouth, and Weston-super-Mare.

Bills read a second time and committed: Filey Water and Gas Bill; Malvern Water Bill.

Bill reported: Penmaenmawr Local Board Bill.

Petitions against the following Bills were presented:—

London County Council (Water Supply, &c.) Bill, from Bromley, East London Water Company, Grand Junction Water Company, Kent Water Company, Leatherhead and District Water Company, and New River Company.

London Water Commission Bill, from the Leatherhead and District Water Company and the Southgate Local Board.

Metropolis Water Supply Bill, from the Hertfordshire County Council, Hornsey, Leatherhead and District Water Company, Reading, Southgate, and Willesden.

HOUSE OF LORDS COMMITTEE.

(*Before Lord* HENLEY, *Chairman; Earl* DUNDONALD, *Lord* DE ROS, *Lord* COLCHESTER, *and Lord* SEATON.)

MALVERN WATER BILL.

This Bill came before the above-named Committee on March 3. Its object is to authorize the Malvern Local Board to construct additional works; to amend the provisions of an Order obtained in 1871 as to charges for the supply of water; to provide for the discontinuance of a method of charging by meter, and for water-rents to be charged according to the rateable value; to authorize the Board to borrow money; and for other purposes.

Mr. LITTLER, Q.C., and Mr. CLAUDE BAGGALLAY appeared for the promoters; Mr. PEMBROKE STEPHENS, Q.C., and the Hon. A. LYTTELTON, for the County Council of Worcestershire, who had petitioned against the Bill—other opponents being represented by Mr. PEMBER, Q.C., Mr. G. WELLS, and Mr. GENT.

The proceedings opened on the above-named day with a statement of the case by Mr. Littler, who explained that the object of the promoters of the Bill was to supply to their district a larger quantity of water than it has hitherto had. The place was peculiarly situated in regard to water supply; and a great and increasing difficulty had arisen by reason of the number of wells—especially the more shallow ones—giving out or becoming extremely feeble during seasons of drought. The present scheme proposed the construction of a reservoir with a capacity of 40 million gallons, to be conveyed by pipe-lines for the supply of the whole district. The total expense would be £32,400; but adding a little more than 10 per cent. for contingencies, the outside cost would be £36,000. The Worcestershire County Council had petitioned against the Bill. But the Justices, whose successors they were, could not have been heard; and he therefore submitted that the Council had no more right to interfere than the County Council of London or Middlesex. Neither could he see how the Ecclesiastical Commissioners, who had also petitioned, were affected, Mr. Berington, however (another petitioner), did stand in a different position from the rest, because the promoters proposed to take land of his. If Mr. Berington established that there was any real injury to him, the promoters must compensate him. But with regard to this, their Lordships would hear from the Engineer that Mr. Berington need have no apprehension. He also opposed the *locus standi* of Mr. Roper as a conservator. Mr. Pembroke Stephens, representing the Worcestershire County Council, then replied on the question of *locus standi*. He submitted that the action of the County was a public one; and a very important question was raised. Before sanctioning the scheme, the Committee ought to be satisfied that the Malvern Hills would not be materially affected as a public place of recreation by the drying up of open springs and the permanent erection of water-works. Mr. Pember followed, on behalf of Lady Henry Somerset, of Eastnor Castle, who alleged that the sanctioning of the scheme would mean a serious abstraction of water now necessary for her farms. Mr. Pembroke Stephens having been heard on behalf of Mr. Roper, their Lordships had a private consultation, the result of which was to allow the *locus standi* of the County Council, but not that of Lady Henry Somerset and Mr. Roper.

The next day witnesses were called for the promoters. The first was Mr. W. R. Copland, M. Inst. C.E., who stated that he inspected the Malvern district in September last year, with the view to preparing a scheme of water supply. He found the state of things in Malvern, with regard to water, simply desperate. The reservoir site he had chosen was that which was recommended by Mr. Bateman on a former occasion. It was proposed to cover about 6½ acres, and at the outlet-pipe there would be a maximum depth of 60 feet of water. The capacity of the reservoir might, if necessary, be increased to 52 million gallons; but it was quite large enough as proposed. With regard to expenditure, the reservoir would cost £17,500; the main conduit, £9500; the intake wells, £2500; the filters, £3000—an allowance for contingencies bringing up the amount to £36,000. He was certain that the estimate would cover all costs that might be incurred. The embankment would be perfectly safe, and need not cause the slightest uneasiness to people living in the neighbourhood. In answer to the Hon. A. Lyttelton, who appeared for the Great Western Railway Company, witness declined to undertake not to diminish the water now available, or to pledge the promoters to give compensation water. Replying to Mr. Willis-Bund, who appeared for owners of property in parishes affected, witness said three-fourths of the water in the drainage area would be taken, and the property-owners would receive one-fourth in compensation water. Dr. C. Meymott Tidy gave evidence as to the quality of the supply, which, he said, was a very beautiful water indeed. The Rev. W. Grundy, a member of the Malvern Local Board, bore out Counsel's opening statement as to the present population and rateable value of Malvern; and he went on to say that the question of water supply was now of vital interest to the town. Since 1887 matters had become most serious; and last summer representations were unceasingly made to the Local Board, who found themselves unable to meet the requirements of the inhabitants. The public wells were emptied four or five times a day, while all the private wells were also exhausted. The proprietors of the latter allowed the Board to take what water they could from these sources, and it was carried in water-carts to the upper end of the pipes and thence allowed to trickle down.

On the following day, additional evidence was given in support of the scheme. Mr. Palmer, Surveyor to the Local Board and Manager of the water-works, gave particulars as to the existing sources of supply. He said that to his own knowledge there had been a deficiency for some 17 years. This caused a very uneven supply, though the Board did their best to distribute the water equally. From his experience at Malvern, he was able to say that the present private well service was inadequate. Storeage was what they required. Mr. E. Archer, a property-owner in the district of Malvern, said he had been a resident practically all his life, and during the whole time an improved water supply had been urgently needed. He had always been in favour of a hill, and opposed to a well supply, not only on account of the difficulty of storeage, but because it would yield brine. Nothing had been done towards improving the matter, because opinions had been divided; but at the ratepayers' meeting held to obtain sanction to the scheme of the Board, only one person opposed, and he afterwards acknowledged that he did so by mistake. Mr. Buck, land agent and surveyor, of Worcester, formerly agent for Earl Somers, whose estate joins that of Mr. Berington, then gave evidence as to the latter gentleman's petition. He said no inconvenience would result to him from the scheme which could not be amply compensated for by a money payment. Mr. T. Hawksley was then called. He stated that he knew perfectly well the requirements of the Malvern district, which was renowned for the purity of the water obtained from the syenitic rocks. For a non-manufacturing population, 15 gallons per head per day was sufficient, if high pressure was constantly kept up. Mr. Copland's scheme was an excellent one. The compensation water proposed by the Bill was sufficient; and the estimate as to the cost of the works was ample. The borrowing powers would prove more than sufficient to meet all emergencies. It might also be urged in favour of the scheme that it need not be final, but could be extended. This closed the case for the promoters.

The objections of the opposing property-owners who had petitioned against the Bill were then stated by Mr. Willis-Bund. He said it was not denied that the water supply of Malvern was insufficient; but there was no need for the Bill as presented. The Local Board seemed to have gone a little mad on the subject of gravitation, and had kept everything else out of sight; for they had adopted a gravitation scheme against the evidence of eminent engineers. The petitioners were, of course, interested in the welfare of Malvern; but they asked that their property should not be interfered with unless there was an absolute necessity for it, and unless they had compensation, for which the scheme did not provide. Mr. Henry J. Marten, M. Inst. C.E., was then examined. He described the Board's scheme as a rather unusual one. Where the available rainfall was below 48 inches, the customary compensation allowance was one-third. In this case there should be greater compensation than was proposed, owing to the peculiarly spongy nature of the soil. Not less than 46,000 gallons a day should be given as compensation. It was proposed by the Bill that muddy water should be conveyed into the proposed reservoir by one pipe, then filtered, and conveyed out again by the same pipe. Unless the impure water went through at a certain rate mud might be deposited in the bends of the pipe; though, of course, provision for scouring at the bends might meet the trouble. He believed it would be a difficult matter to make the reservoir fairly tight; for he did not think Mr. Copland would find the unfissured bottom he hoped for. Mr. G. W. Hastings, M.P., a property-owner in the parish of Welland, said he knew the place where the Board proposed to construct their works. If the streams were cut off, his property would be depreciated certainly 30, if not 50 per cent. He represented Malvern on the Worcestershire County Council, was interested in the welfare of the place, and was favourable to a good water supply for the town; but, at the same time, he thought the promoters should obtain the supply without damaging the property of other people.

The next day, further evidence was given by property-owners, who alleged that they would be affected by the proposed scheme. At its close, the Hon. A. Lyttelton addressed their Lordships on behalf of the Great Western Railway Company. He said that his clients took up the position assumed by Mr. Hastings—they were not opposed to Malvern having a better water supply, but the Local Board should seek to obtain it without damaging other people's property. If the Bill was to proceed, it should do so with fitting safeguards, that the interests of others should not be injuriously affected. The preamble ought not to be assented to unless it was made clear beyond all question that

underground pumping should not be authorized, because the Company's water might be abstracted thereby. Mr. Wells then called Mr. G. M. Berington in support of his petition. He said he was owner of the Little Malvern Court Estate; and the proposed reservoir embankment would materially injure his freehold, both in point of interest and of money value. The reservoir would be almost within his grounds; and, if constructed, it would considerably increase the difficulty as to trespassers. The view would be interfered with; and he disagreed with the statement of the promoters' Engineer that it would be improved. Even if the safety of the intended reservoir could be demonstrated, his Hill Farm could only be let at diminished value. There were other available sites for the works. He was not satisfied with the compensation water offered. He desired his estate to remain as he received it. The property had been in his family for 300 years, under a grant of Phillip and Mary. If he could not help himself, he would take what compensation he could get. Mr. H. Cave, a land agent, asserted that the intended works would sever Mr. Berington's land, and otherwise damage Little Malvern as a residential estate. Mr. Wells then addressed their Lordships on Mr. Berington's behalf; reviewing the evidence he had called in support of that gentleman's petition. He maintained that the Bill involved actual loss and probable inconvenience, and did not provide that Mr. Berington would not be damaged. Mr. Spencer Gore was examined on the petition of the Ecclesiastical Commissioners; and Mr. Hawksley, recalled, said in an agricultural district one-fourth was the proper compensation water allowance. Mr. Pembroke Stephens summed up the objections to the Bill raised by the Commissioners and the Worcestershire County Council. The promoters' case, he argued, must be taken with very grave reservations, as sanctioning the proposed reservoir might be a serious matter for the various parties affected.

At the next sitting of the Committee, Mr. Pembroke Stephens continued his summary of the objections to the scheme. He contended that the statistics supplied with regard to the requirements of Malvern had been considerably exaggerated. What was the reason of that? Their Lordships would see by clause 7 of the Bill that the Local Board might from time to time supply water within the water limits as was thought fit. Against this he had nothing to say; but he would call attention to clause 32, by which the Board sought power to supply water to any sanitary authority, company, or person, upon such terms as they could agree upon. The fact, therefore, was that the promoters wanted these exaggerated powers in order that they might sell the water; and the less their Lordships granted in the way of compensation water, the more the promoters would have to dispose of. This was material, when the Committee remembered that the scheme was admittedly an extravagant one. The money powers of the Bill were something like £60,000. The population in respect to which it was proposed to spend this amount was a residential one of 6000, augmented by about 2000 in summer. The effect would be that the Board would be encouraged to sell as much water as they could, in order to meet the expense. His clients complained of the way in which their rights would be interfered with in the matter of roads. It was proposed to have a pipe constantly under pressure, first from one end and then from the other; and, whatever precautions might be taken, this would be a source of danger against which his clients ought to be protected. On behalf of the Ecclesiastical Commissioners, he would merely point out the important interests they represented and sought to have protected. Mr. Littler, Q.C., replying on behalf of the promoters, said the clause to which his learned friend had objected was the model one approved for the past 20 years by Parliamentary Committees and the Board of Trade. Its object was to empower local authorities who had water to sell it to those who had not, and thus save enormous expense to a neighbouring small community. His learned friend seemed to imagine that the promoters, in putting this clause in the Bill, had some sinister motive. Where were the people around Great Malvern who were going to take all the water spoken of? At present nobody needed it. But it might happen that in course of time there would be a small place just outside the district in want of water; and under the clause Malvern would be able to supply it. As to the question of compensation water, the learned Council contended that the scheme would not prejudice in any way the opponents of the Bill. On the contrary, their positions would be improved. Having dealt with the petition of Mr. Berington, he said this gentleman would be entitled to ample compensation for any damage done to his estate, under the provisions of the Lands Clauses Act, which laid it down that, in estimating the value of land to be purchased, regard should be had to the damage, if any, sustained by reason of severance or otherwise. In conclusion, the learned Counsel dwelt upon the importance to Malvern of a thoroughly satisfactory water supply. The country presented many engineering difficulties; but his clients had endeavoured to, and believed they had overcome them in a very successful manner. After a short consultation with his colleagues, the Chairman announced that the Committee were of opinion that the preamble of the Bill had been proved. They then deliberated in private for a few minutes. On the public being readmitted, the Chairman stated that the Committee were of opinion that Mr. Berington would be amply safeguarded, with regard to his farmhouse, by the general law; but they thought that clauses should be inserted protecting his garden-walls and greenhouses from the laying down of pipes, and also to prevent his fishponds and ornamental waters being interfered with. The Committee were of opinion that the compensation supply should be one-fourth of the average supply; to be given, if possible, in a continuous stream. They did not think it was necessary to insert a special clause for the protection of the Great Western Railway Company's interests.

The Cardiff Corporation and the Contractor for the Taff Vawr Water-Works.—In reference to the paragraph bearing this heading which appeared in the JOURNAL for the 7th inst., it was announced at the last meeting of the Cardiff Corporation Water Committee that Mr. Mackay had given his almost unqualified assent to the proposals of the Council as to the terms upon which he should be released from his contract.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Thursday, April 16.

(*Before Mr. Justice* CHITTY.)

Fareham Local Board and Fareham Electric Light Company v. Smith.

This was a motion, treated as the trial of the action, by the above-named Local Board and Electric Light Company, for an injunction to restrain the defendant from removing, cutting, or otherwise interfering with the electric wires and apparatus placed in Osborne Road, Fareham, for lighting the road in question and other public places in the district. It appeared that the Board had entered into a contract with the Company to supply the town of Fareham with electric light. No Licence or Provisional Order had been obtained by the Company from the Board of Trade, under the Electric Lighting Acts, 1882 and 1888; but they had erected their poles and overhead wires under a Licence from the Local Board. The defendant was owner in fee in possession of land having a frontage of 120 feet to Osborne Road, which was a highway repairable by the inhabitants of Fareham at large, and vested in the Board. The defendant had sent in to the Board a copy of plans of intended buildings on his land; and he alleged that the poles and wires which were erected on his side of the road, and rose to a height of 16 to 19 feet, would interfere with these buildings. As owner of the land adjacent to the highway, he claimed to be entitled to the subsoil of the adjoining half of the highway, and to treat the plaintiffs as trespassers. It will doubtless be remembered that this matter, in another phase, recently came before the Lord Chief Justice at the Hampshire Spring Assizes (see *ante*, p. 502).

Mr. WHITEHORNE, Q.C., and Mr. A. GLEN appeared for the plaintiffs; Mr. FARWELL, Q.C., and Mr. BOVILL SMITH appeared for the defendant. The matter had been before his Lordship on previous occasions, when the defendant was represented by Mr. Romer, Q.C., and subsequently by Mr. Henn Collins, Q.C., both of whom have since been raised to the Bench.

Justice CHITTY said the defendant in this case claimed to have a right to cut the wires of the Electric Light Company because he was the owner of the soil of half of the road, subject only to any statutory rights vested in the Local Board. The defendant said that inasmuch as the subsoil below such part of the surface as was included in the term "street," as used in the Public Health Act, 1875, was vested in him, his right, as proprietor of the subsoil, carried with it the property in the air above the surface, subject only to such rights as the Local Board also had in the air. This was the main ground on which the defendant justified his threat to cut the wires. The conveyance under which the defendant derived his title to the property did not specifically pass half of the road; but the defendant's right thereto depended on the application to the case of the rule that where a "close" in a conveyance was described as bounded by a public highway, half of the soil of the highway belonged to the grantee, unless the legal presumption of this effect was rebutted. Whether the circumstances of the present case were sufficient to constitute a rebuttal was a question on which, in his opinion, it was unnecessary to come to a decision. He would, however, assume that the point was in favour of the defendant, and that he was right in his claim to the soil of the road. At the time the conveyance was made, the road was dedicated to the public, and the Local Board had taken it over, and it was a public highway for all purposes. The road was, under the Public Health Act, 1875, a street vested in the Board; and, according to the authorities, what was comprised in the term "street" was not merely the surface of the road, but the soil below the surface to such a depth as was required for the purpose of enabling the local authority to execute its statutory powers and to perform its duties. Another way of stating the proposition was to say that there was vested in the Board the area of user of the road below its surface; and a similar and corresponding proposition might be correctly stated with reference to the zone above the surface. In the present case, the Board had contracted with the plaintiff Company for the supply of electric light for public purposes. In pursuance of such contract, and, as the plaintiffs contended, by virtue of the Board's statutory right, posts and wires had been erected. The defendant did not complain of the work done being unnecessary for its purposes, or beyond what was justified to carry out its object. It appeared to his Lordship, therefore, that the defendant must fail, unless he could show that what had been done by the plaintiffs (and for this purpose it was not necessary to distinguish between either the Board or the Company) was a trespass. The question, therefore, arose whether the works were within the area of user of the street. He thought they were within the zone which the statute had vested in the Board. This being so, the defendant was not entitled to assume the position of Attorney-General and interfere. The Company had argued that they had only done what they had the right to do by virtue of the powers conferred on them by the Board. It appeared that, pending the hearing of the present action, the Company had been indicted for a public nuisance. The trial came on last month at the Hants Assizes; and the jury, by the direction of Lord Chief Justice Coleridge, acquitted the defendants. What Lord Coleridge held was that the Company were protected by the licence of the Board, who were acting within their authority; and that the law justified the Company. In his direction to the jury, Lord Coleridge rested his decision on section 161 of the Public Health Act, 1875, which stated that a local authority might contract with any person for the supply of gas or other means of lighting the streets in their district, and might provide such lamps and other materials and apparatus as they might think necessary for the lighting thereof. Lord Coleridge held that "other means of lighting" included electricity. He respectfully concurred in what the Lord Chief Justice held. The Company's position was the same as if the Local Board itself had put up the posts and wires. The Board contracted with the Company that the latter should do the work, and provide the posts and other apparatus; and the Company were not to be at liberty to remove them for a term of years still unexpired. It appeared to him that what was being done fell within the words of section 161. Mr. Henn Collins had delivered

a concise and able argument with reference to the second and third paragraphs of that section, which spoke of gas undertakings being established by the urban authority when there were no authorized suppliers of gas; and on this he founded the proposition that the Board were acting *ultra vires* when they engaged in providing apparatus for lighting which was not lighting by gas. He (Justice Chitty), however, was of opinion that the paragraphs in question did not affect the statutory power of a Board to supply light by other means than gas under the general words of the first paragraph (sanctioning contract with any person for the supply of gas or other means of lighting), and that in this respect they were not a modification of the general powers contained in that paragraph. It appeared to him that the second and third paragraphs were inserted because of the well-known course of legislation with respect to gas companies, which, to use terms which had been often applied to them, had a "regulated monopoly" in their particular districts; and the meaning of the second and third subsections was that the urban authority should not invade that monopoly when conferred by statute. He had referred to the argument on the second and third paragraphs because, so far as he was aware, the point had not been mentioned at the trial before Lord Coleridge. The result was that thus far he was in favour of the plaintiffs. But another point had been raised on behalf of the defendant, and that was that there existed a public nuisance, inflicting special damage on him. If, however, the facts were, as he (Justice Chitty) had held them to be, that the acts complained of were not a public nuisance, this part of the case fell through. The defendant said that he desired to build on his ground, and that the posts and wires interfered with his proposed plans as sent in to the Board. At the bottom of this action there had unquestionably been a contest between electric lighting on the one hand and gas lighting on the other. He did not propose to give any opinion as to whether or not the plans were sent in by the defendant to embarrass the Board. It, however, seemed to him that the possibility of the posts and wires interfering with the amenities properly enjoyable by the defendant, or with his convenience, was not a contingency which would justify the Court in refusing an injunction at the present time. Moreover, the point was one which might be provided for by means of compensation, under section 308 of the Public Health Act. He therefore granted an injunction as asked, with liberty to both parties to apply, so that, if any unforeseen circumstances should arise, the defendant might apply to modify the injunction. The costs would follow the event.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, April 14.

(*Before Justices* A. L. SMITH *and* GRANTHAM.)

Fletcher v. Fields—The Unloading of Coke on the Public Footways.

This was an appeal from the decision of Mr. Sheil, one of the Magistrates at the Westminster Police Court, convicting The Gaslight and Coke Company, under section 15 of the Metropolitan Streets Act, 1867 (30 and 31 Vict., cap. 134), for unloading a quantity of coke on the footway of Victoria Street, Westminster, between the hours of ten and six in the daytime. The proceedings before the Magistrates were reported in the JOURNAL for Nov. 11 last year (p. 1008). The question at issue was whether coke came within the meaning of the word "coal" as used in the Act.

Mr. HORACE AVORY appeared for the appellant, on behalf of the Company; Mr. SCRUTTON for the respondents, the Commissioners of Police.

Mr. AVORY argued, in the first place, that coke was not coal, in the natural sense of the word; secondly, that there was nothing in the Act of Parliament by which any extended meaning could be given to the words of the section; thirdly, that in all Acts of Parliament dealing with the subject of coal it was always distinguished from coke, and that whenever the Legislature had intended to make a law in respect of coke, it had been expressly mentioned. He also argued strongly that whereas coal was always sold by weight, coke was sold by measure; and he said that nobody had ever suggested that the Acts of Parliament requiring coal to be sold by weight applied at all to coke. The learned Counsel went exhaustively through the Acts of Parliament; showing the distinction made between coal and coke. He cited first the 52 and 53 Vict., cap. 17, in which "coals, culm, or cinders" are specifically mentioned. Then by the 14 and 15 Vict., cap. 146, which was an Act regulating the dues upon coal and the sale and delivery of it, a great distinction was made; section 35 dealing only with coal, and section 36 with coke. He pointed out that, on looking at the Act which had to be construed, there was no reason to hold that the word "coal" should be taken to include anything it did not mention, because by section 6 there was a general provision dealing with other goods or articles besides coal. By section 15 they chose to make a special regulation with regard to coal; but he did not dispute that coke came within the words "goods or other articles."

Mr. SCRUTTON said, his learned friend having provided for their Lordships a series of statutes, he had come with a series of dictionaries, and in every one, on turning to the word "coke," he found it described as a variety of "coal." The "Imperial Dictionary" defined coke as "coal deprived of its bitumen, sulphur, or other extraneous or volatile matter, by fire;" and therefore he said that coke was really the genuine coal with this extraneous matter taken out. Webster's Dictionary defined coke as "fossil coal deprived of its volatile matter by fire." The learned Counsel contended that coke was coal within the meaning of the Act; and he submitted that the mischief the Legislature intended to deal with was the carrying of all varieties of coal over the footway, and that it was sufficient to use for this purpose the generic term "coal," which included the variety of coal which was called "coke."

Their Lordships then proceeded to give judgment.

Justice A. L. SMITH: This is an appeal from a decision of one of the Metropolitan Police Magistrates, and the question is a very small one. It turns upon the construction of section 15 of the Metropolitan Streets Act, passed in 1867. I wish to refer first of all to section 6, to which Mr. Avory has called our attention. Under this section it is enacted that no goods or other articles are to be allowed to rest on any footway, and cause an obstruction or inconvenience, for a longer time than may be absolutely necessary for loading or unloading such goods or other articles. There the Legislature has inserted a section to prevent obstruction by any goods or articles upon the footway being left there longer than is necessary for loading and unloading them. But when we come to section 15 of the Act, they have enacted an express prohibition as regards two articles, and two articles only, between certain hours of the day. [His Lordship read the entire section.] Then we are asked to hold that the Legislature has said something which unquestionably it has not said. In 1867 the words "coke" and "coal" were perfectly well known; and this is a case in which a prohibition is placed upon the public between certain limits as to two specified articles—viz., coal and casks. Why am I to stretch these words, I should like to know? It seems to me that, in construing this statute, I am not at liberty to stretch them. I asked Mr. Scrutton whether he would say that it was an offence within this Act to load or unload cinders. He says that goes too far off coal to come within the meaning of the Act; and he would not say that he could hit a man for unloading cinders. Then I asked him why he could hit a man for unloading coke; and he says because it is a little nearer coal than cinders are. It seems to me that we should not be construing this statute in the manner statutes ought to be construed if we said the word "coal" included "coke." We ought not to put into the Act another product which is not mentioned, and particularly in a section which has prohibited that which the public would otherwise have the right to use—viz., the using the public streets of this kingdom for their own private or business purposes. It seems to me that the learned Magistrate was in error in finding that the product "coke" was covered by the word "coal." It may look like a narrow decision of ours; but I cannot come to any other conclusion than that coke does not come within section 15 of the Act 30 and 31 Vict., cap. 134.

Justice GRANTHAM: This is a statute which undoubtedly deals with the liberty of the subject; and we ought not to extend its meaning unless it is quite clear that it is intended that we should do so. Looking at the character of the statute, it is quite clear what the object of it was—viz., to prevent the public from being inconvenienced by things which were most likely to inconvenience them. An immense number of things might be named which no doubt are more or less inconvenient to the public—viz., the carting of dust from the houses in the various dust-carts. But although they are certainly as inconvenient as putting coal down cellars and are very often more dangerous, the Legislature has not prohibited them. It has prohibited two specific things—the carting of coal and the unloading of casks—within certain specified hours. Now, if it had intended also to include coke, or anything but casks and coals, or to include coke in particular, it would certainly have said so. Coke being a manufactured article—what may be called a residual product of coal—if it were intended to be applicable to coke coming from gas-works, I do not think it is such a general term as "coal" that should be used in regard to it, because coke is an article which is made not for extracting the gas from it, but because, when the coal has been coked, it can be used for certain specific purposes. It is not an article which is in common use for domestic purposes, and consequently it was not thought necessary to legislate against it. Consequently our judgment must be for the appellant.

The conviction was quashed, and the appeal allowed, with costs against the Commissioners of Police, but not against the Magistrate.

WESTMINSTER COUNTY COURT.—Monday, April 13.

(*Before Mr.* F. BAYLEY, *Judge, and a Jury.*)

Canning v. The Gaslight and Coke Company—Claim under the Employers' Liability Act.

In this case, the plaintiff, William Canning, sued The Gaslight and Coke Company, under the provisions of the Employers' Liability Act, to recover damages for personal injuries sustained in consequence of the alleged defective condition of their plant.

Mr. RUEGG appeared for the plaintiff; Mr. HORACE AVORY represented the Company.

Mr. RUEGG, in stating the case, said the plaintiff was a stoker in the employ of the defendants at their Beckton works, and his duty was to attend to the retorts. While engaged in pushing coke into the coke-hole, his left hand came in contact with a broken portion of the "fender," with the result that a serious wound was inflicted. In consequence of this injury, he was incapacitated for five weeks, during which time he lost about £9 in wages. Since that time he had not been able to follow his usual occupation, but was employed in another part of the works at lower wages.

Plaintiff having been called to bear out this statement,

Two workmen gave corrcborative evidence as to the defective condition of the fender,

Mr. AVORY then addressed the jury on behalf of the defendants; and subsequently called

Mr. *N. Head*, the foreman of the retort-house in which the accident occurred. He said he had examined the fender, and found that there were only two rivets short. The fender was not displaced more than ⅜ inch; and had been used in the same condition for several weeks after the accident, without a single complaint being made about it.

Edward Kerns, a carbonizing foreman in the defendants' service, said he examined the fender on the night of the accident, and found that two bolts were missing, and that it had slipped about ⅜ inch out of its place. He attributed the accident to the fact that the plaintiff was standing in a wrong position in front of the fender. The plaintiff was engaged as a scoop-driver; and, as such, it was not his duty to be doing the work on which he was engaged when he met with his injury.

His HONOUR said the questions the jury had to consider were: First, Was there a defect in the fender; and, if so, did it cause the accident? Secondly, Was there contributory negligence on the part of the plaintiff? because if there was, he was not entitled to compensation.

The jury found for the plaintiff, and assessed the damages at £35, for which amount judgment was entered, with costs.

MISCELLANEOUS NEWS.

METROPOLIS GAS SUPPLY.

Recent Appeals to the Chief Gas Examiner.

(*Continued from p.* 704.)

In the matter of the appeals of THE GASLIGHT AND COKE COMPANY *against the reports of the Gas Examiner at the Spring Gardens testing-place, showing insufficient illuminating power in the gas supplied by the Company on Nov.* 26 *and* 27, 1890.

Each of these appeals was lodged within seven days after the day on which the report respecting it was made. At the hearing which I gave to the parties, Mr. Trewby appeared for the Company; Mr. Dibdin appeared for the County Council.

The Company attributed the lowness of the tests to the manner of using the standard candles. One of their officers obtained considerably higher values of the illuminating power for the gas when taken in the same building and at nearly the same times with the official tests. The officer who performed these tests for the Company adopted the limitations in the use of standard candles which were considered by the Company to give the more "normal" flames, and avoided the use of any candle whilst its wick was less approaching to the vertical position. This officer of the Company had for some time past paid considerable attention to this matter; and it appeared from his statements that some perfectly statutory candles do not burn with the slightly-bent wick which is most favourable to the gas until they have been lighted for an hour or an hour and a quarter.

The Official Gas Examiner appears to have performed his tests carefully, and in due conformity with the Instructions of the Gas Referees; and I consider that the reports must be accepted.

(Signed) ALEX. W. WILLIAMSON, Chief Gas Examiner.

March 9, 1891.

In the matter of the appeal of THE GASLIGHT AND COKE COMPANY *against the report of the Gas Examiner at the Spring Gardens testing-place, showing deficient illuminating power in the gas delivered by the Company on Dec.* 22, 1890.

The appeal was lodged within seven days after the day on which the report was made. At the hearing which I gave to the parties in this appeal, Mr. Dibdin appeared for the County Council; Mr. Trewby appeared for the Company.

The Company pleaded that the tests were vitiated by the thick fog and smoke which prevailed in that part of London on the day of the tests. So thick was the air at the time, and so great the darkness, that the Company had to send out an extraordinarily large quantity of gas. The Gas Examiner who performed the tests confirmed the statement of the Company, and said that the testing-room and the photometer contained at the time of the tests a visible quantity of fog and smoke. There is reason to believe that such thickness of the air as prevailed at the time of the tests must to some extent have vitiated the tests of illuminating power; and I consider that the tests must be cancelled.

(Signed) ALEX. W. WILLIAMSON, Chief Gas Examiner.

March 10, 1891.

THE GAS QUESTION AT NORWICH.

The gas supply of the borough formed the principal topic of discussion at the meeting of the Norwich Town Council last Wednesday week. A letter received by the Town Clerk, dated March 18, 1891, from Mr. Frederic Lane Linging, Secretary of the British Gaslight Company, Limited, was first read, giving notice of their intention to increase the price of gas from 3s. 4d. to 3s. 10d per 1000 cubic feet After this a report was submitted by the Executive Committee, in which they dealt at considerable length with the affairs of the Company; the greater part of the particulars they gave being taken from the last-issued parliamentary returns. The report concluded as follows: "Your Committee have ascertained that, in consequence of the dearness and bad quality of the gas supplied by the British Gaslight Company at one of their stations to the public lamps, the local authority at that station decided to light the streets with petroleum, and that it has been in use over two years, and gives better light. Inquiries have been made at the four other stations of the Company as to an increased price at those stations. Norwich is the only station at which an increased payment for gas has been demanded. Having regard to the large capital of the Company, which would have to be taken over with heavy compensation for compulsory purchase, the inferiority of the works and plant to works of modern construction, and to the fact that the works are divided into establishments at Bishop Bridge and St. Martin-at-Place, which in our opinion increases the cost of manufacture, we advise the Council not to attempt to purchase the works by compulsion or arrangement, but to delegate to a Committee full authority to investigate further the accounts and management of the Company, and to take such steps as they may be advised to obtain a Provisional Order of the Local Government Board, or an Act of Parliament, authorizing the Council to construct works upon modern principles, to supply gas for public and private purposes throughout any part of the city." Sir H. Bullard moved that the report be adopted and referred to the Executive Committee to carry out the recommendations contained therein. He thought they had a strong indictment against the Gas Company; and he could not for one moment believe the Legislature would permit Norwich to be supplied with gas of such a low standard of illuminating power. He did not think it advisable to enter into the question of purchasing the gas-works as they were at present. He believed the concern was overloaded with capital; and if they were to buy, they might, with the compensation and the percentages they would have to pay, find themselves at last in a worse position than they were in at first. He was told by experts that the present plant of the Company was not at all adequate to supply the wide area of Norwich; and the general idea was that the Corporation should go to Parliament for legislative powers to erect new works. It would not do for them to temporize, or they might be led into a compromise. Alderman White seconded the resolution; and he ventured to assert that there was not a single large town in England that was not supplied with gas many pence cheaper than they were in Norwich; and in some cases it was supplied at half the cost. At Plymouth the price was less than half; at the British Gaslight Company's own station at Hull, it was 1s. 10d.; at Exeter, an inland city quite as badly fixed at Norwich and not so large, 3s. 1d.; at Manchester, 2s. 6d.; at Bury St. Edmund's, where there were only 1000 consumers, 3s. 6d.; at Yarmouth, 3s. 3d.; at Cambridge, 2s. 10d.; and at Ipswich, 2s. 10d. No one could conceive that Bury St. Edmund's, Cambridge, or other towns of that sort were exceptionally situated for the cheap production of gas as compared with Norwich. It was said that the cause of the large amount of capital in Norwich was the wide area over which the mains were extended, and the comparatively small number of consumers. He thought this point gave them one of their strongest reasons for going to Parliament for power as suggested. In Norwich there were 6459 consumers; in Huddersfield, 16,350; in Derby, a town of about the same size as Norwich, 14,662; in Leicester, a town twice the size of Norwich, 23,347; and in Northampton, a town not much more than half the size of Norwich, 7595. Thus not much more than a fourth of the population of Norwich took gas from the Company, who had so kept up the price and kept down the quality, that people did not care to have it if they could possibly avoid it. Upon the points raised in Mr. Linging's letter as to the cost of coal and the increase of wages, he found, according to the balance-sheet rendered, the cost of coal for the year was £5500 more than for the preceding year. There was between £2000 and £3000 more charged for the last half of the year than in the preceding half. He found there was no such differences in other companies' balance-sheets, according to which the coal was pretty equal for both half years, and the amount carbonized in Norwich was about equal. It seemed to him that the burden of the cost of coal was made to fall on the half year much beyond what it ought to be. In reference to the cost of wages, in one half of 1884 the wages bill was £200 more than that of 1890. Further discussion followed, in the course of which Mr. Watson said he had gone through the figures as to the price of gas in 83 towns between 1886 and 1890 supplied by companies, and in 33 towns where the local authorities manufactured the gas. He found that the average charge per 1000 cubic feet in the 83 towns in 1886 was 3s. 3d., and in 1890 it was 2s. 11d. In the 33 towns the average price of gas in 1886 was 3s. 1d., and in 1890, 2s. 8d. If the public companies could thus in this period reduce their charge 4d. per 1000 feet, and the local authorities their price 5d., he failed to see why in Norwich the Company should raise the price by 6d. He hoped the citizens would resist this imposition. On the resolution being put, it was carried unanimously.

OLDBURY LOCAL BOARD GAS SUPPLY.

At the Meeting of the Oldbury Local Board last Friday—Mr. A. Thompson presiding—the report of the Gas Committee, with the statement of accounts of the department for the year ended Dec. 31 last, was presented. It showed that the total amount of money borrowed at that date was £79,199, of which £6535 had been repaid; leaving the outstanding loans £72,664. During the past year a sum of £226 was spent on new mains, &c., bringing up the aggregate expenditure to £75,836. The revenue account showed that the cost of coal was £4044; wages, £671; repairs and maintenance of works and plant, £391; distribution expenses, £379; lighting and repairing public lamps, £268; rates and taxes, £518; and management expenses, £351. There was an item of £1242 for law costs, including a bonus of £1000 for the transfer of loans; and the total expenditure was £8063. On the other side, the sales of gas realized (including public lighting) £8744; the residual products, £2486; and the amounts received for fittings, and discounts on purchases, made the aggregate receipts £11,312. This showed a gross profit of £3249; but after deducting the interest accruing on loans and instalments for repayment of loans, the balance, being the net profit, was £392. The working statement of the Engineer and Manager (Mr. C. Meiklejohn) showed that 5521 tons of coal and 257 tons of cannel were carbonized during the year; the residual products being: Coke, 3614 tons; breeze, 216 tons; tar, 85,435 gallons; and ammoniacal liquor, 171,965 gallons. In moving the adoption of the report, Mr. Wilson explained that the gross profit was less than in the previous year, in consequence of the bonus of £1000 which the Board had had to pay in order to get the loans transferred, to reduce the interest payable from 4½ to 3½ per cent.; and it was thought right to charge these costs to the revenue account. The effect of the transfer was a saving of rather more than £500 in the amount of interest payable each year. A further advantage was that the redemption of the loans had been spread over the full period allowed by their Act of Parliament. The Committee were not, however, prepared to recommend a reduction in the price of gas, because, if no change took place in the cost of coal and slack, it would increase the expenditure about £1000 as compared with the previous year, which would swallow up any possible surplus the Committee might have expected. At the same time, they thought there were brighter days in store for the department; and he congratulated all concerned upon the satisfactory results of the past year's business. The report was approved.

New Joint-Stock Companies.—The Petroleum Gas Light, Heat, and Motive Power Company, Limited, has been registered with a capital of £40,000, in £1 shares, to acquire certain patents relating to the production of gas for lighting, heating, and other purposes. The Staffordshire Chemical Company, Limited, is to carry on the business of chemical manufacturers, or any undertaking connected therewith; the capital proposed to be raised being £50,000 in £10 shares. The Sewage Purification Company, Limited, with a capital of £100,000, in £5 shares, is to acquire from Messrs. B. and H. B. Jagger certain inventions in connection with the purification of sewage and other waters, and to carry on the business of sewage purification, &c.

SAN PAULO GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Thursday, at Pinner's Hall, Great Winchester Street, E.C.—Mr. F. DELMAR, F.S.A., in the chair.

The SECRETARY (Mr. J. Heath) read the notice convening the meeting; and the report of the Directors and the balance-sheet were taken as read. The former showed that there had been an increase in the consumption of gas amounting to 33½ per cent.; and that although the revenue had been to a certain extent prejudiced by the high rate of freights that ruled during the year, and which had been met by the freight equalization account, the Directors recommended the payment of a dividend at the rate of 10 per cent. per annum, free of income-tax, which would absorb £8541, and leave £1238 to carry forward.

The CHAIRMAN, in moving the adoption of the Directors' report and the balance-sheet, stated that during the past year they had been unceasingly occupied in extending the Company's works; and he was pleased to inform the shareholders that all the plant gave the most favourable results. They had been able to purchase land on very advantageous terms for the purpose of laying out the new works in such a way that they could be enlarged without any extravagant alterations. The remarkable and continuous increase in the consumption of gas (amounting during the past half year to no less than 33½ per cent.) pointed to the prudence, and indeed the absolute necessity, of making further extensions in order to enable the Company to meet the demands made upon them. During the present year the Directors would have to issue the remaining £50,000 of capital in the way the shareholders agreed upon at the previous meeting. They would remember that then the Directors were proposing to extend the gas-works; but he had now the gratification of informing them that they were completed and already in requisition. The new gasholder (which had a capacity of 500,000 cubic feet) was indispensable for the public illuminations; and it cost £25,000. The new retort-house had cost £7700; the cast-iron mains including freight, £13,000; and the purifiers and station meter, £6000—making a total outlay of £51,700. With regard to the ordinary expenditure, there had been a large increase in the price of coal—from 6s. 9d. to 16s. per ton; and freightage was 25 per cent. higher; but he was glad to say that these two items were now becoming more favourable. The shareholders would better comprehend what a large increase there had been in coal and freightage if he gave them the average cost for the past three years. In 1888, it was £1 9s. 3d.; in 1889, £1 16s. 3d.; and in 1890, £1 16s. 6d.—an increase of about 25 per cent. This had been met without making any advance in the price charged for gas, which on the contrary, had been reduced, to the gratification of the consumers. The Chairman than proceeded to give the shareholders some statistics, showing the increases which had taken place between 1888 and 1890 under other headings. The quantity of coal carbonized in 1888 was 4377 tons; in 1889, 5877 tons; and in 1890, 7859 tons. The amount of gas consumed in 1888 was 54 million cubic feet; in 1889, 64 millions; and in 1890, 87 millions—being an increase in the year of 33 millions. The number of meters in use in 1888 was 1948; in 1889, 2628; and in 1890, 3308. In 1888 they had 1316 public lights; in 1889, 1371; and in 1890, 1488. There was besides a further increase in the public lamps in progress. As to the growth of the revenue during the past four years, he found that from July to December, 1887, they received £15,357; in 1888, £16,690; in 1889, £19,845; and in 1890, £28,334. These figures all showed that the increase in business was gradual, but very satisfactory; and he thought they might rely upon it continuing so.

Dr. E. BATT seconded the motion, which was carried unanimously.

The dividend recommended having been declared,

The CHAIRMAN said he wished to make a few remarks regarding the efforts which had been made by Brazilian capitalists to purchase the Company's property. In one case (which was really not worth their notice) they were offered a comparatively small amount of money, and the rest in debentures guaranteed. The guarantee, the Directors inferred, rested upon the amount of the revenue that would be paid if it was earned; and besides, the shareholders would have to give up all their rights to future bonuses. Another offer was made of £10 and £10 in debentures for each £10 share; but in this case also, the shareholders would not participate in any future bonuses, or in the continuous improvement in the value of their property. There was no resolution to put before the shareholders in regard to this matter; but he thought it right they should be informed of the steps which had been taken to acquire the undertaking. The Chairman also made a few remarks as to the position occupied by the electric light; concluding them by saying that as far as he could see, it would not affect the Company in any way. With reference to the proposed issue of the remaining £50,000 of capital required for further extending the works, it was intended to issue it to the shareholders at par.

Mr. JONES remarked that the shareholders were very much indebted to the Chairman for the information he had given them. The figures he had quoted showed that in the last two years there had been an increase in the public lighting of something like 15 per cent. This meant that they were not only obtaining a larger revenue, but that they were on most excellent terms with the Municipality, which was clear proof that the affairs of the Company were being admirably managed at San Paulo. Having also referred to the large increase in the number of meters in use, and congratulated the Chairman upon the fact that this was the twenty-first annual meeting of the Company, he concluded by observing that the shareholders should not for one moment hold out to the Directors the idea that they were prepared to sanction a sale of their works, as he believed they would make greater progress in the future than they had done in the past.

Colonel ROBINSON said he wished to emphasize what had been said by the last speaker as to the disposal of the works. They were quite willing to retain them at all events until 1897, when their present concession expired.

On the motion of Dr. BUCKELL, seconded by Mr. FOWLER, it was agreed—"That the 5000 unissued shares be offered to the shareholders at par *pro rata*."

Colonel ROBINSON then proposed the re-election of the retiring Director (Dr. Batt), which was seconded by Mr. FOWLER, and unanimously carried.

Mr. W. Cash was next appointed Auditor of the Company, in succession to his late father.

A vote of thanks to the Chairman and Directors concluded the proceedings.

KIMBERLEY WATER-WORKS COMPANY, LIMITED.

The Annual Meeting of this Company was held last Wednesday, at the Cannon Street Hotel, E.C.—Mr. A. J. MACDONALD in the chair.

The SECRETARY (Mr. W. Vincent) read the notice convening the meeting; and the Directors' report and the statement of accounts were taken as read. The profit and loss account showed a profit of £30,524; and after providing for the interest on debentures and loans, there remained a sum of £23,827, out of which an interim dividend of 2½ per cent. had been paid, amounting to £7875. It was proposed to divide a further 2½ per cent.; leaving £8077 for depreciation and for the reserve fund.

The CHAIRMAN, in moving the adoption of the report, first referred to the causes of the large diminution in the revenue for the past year. It appeared from his remarks that the cessation of work in the Dutoitspan and Bultfontein mines, and the decreased output of diamonds arising from the amalgamation of several companies, had had a considerable effect in reducing the consumption of water. The chief cause of the diminished revenue, however, arose from the extraordinary rainfall during the year. The actual fall was 23·20 inches, as against 17·61 inches in 1889; and consequently the mines had taken less of the Company's water for washing purposes. On the other hand, it was gratifying to have to record a gradual increase year after year in the consumption of water in Kimberley and Beaconsfield. Last year 64½ million gallons were supplied to these townships, as against 51½ millions in 1889, and 20 millions in 1884; and if this increase continued, the town supply would more than pay the expenses of the Company. Comparing the accounts with the previous year, he pointed out that the expenditure was less by £7500; and there was every likelihood that there would be a further diminution. In the last letter received from their Manager (Mr. R. Ford), he informed the Directors that he was now using colonial coal, which would save them nearly 30 per cent. under the heading of fuel. The annual consumption of coal was 1500 tons; and the cost of English coal delivered in Kimberley was £9 10s., as against from £4 10s. to £5 for native coal. In conclusion, the Chairman read a letter from a shareholder, Mr. White, in which, among other things, he asked whether the proprietors had received 12 per cent. per annum since the alteration of paragraph 79 in the Articles of the Company; and if not, he intimated that he should propose that the sum appropriated by the Directors be returned. In reply to this, he (the Chairman) had to say that the shareholders had not received 12 per cent. each year since the alteration of the Article alluded to; and the Directors had not taken the extra remuneration to which they were entitled under that Article for the years in which the 12 per cent. was not paid.

Mr. J. JACKSON, in seconding the motion, enlarged upon various points in the Chairman's speech. Considering the disaster that had overtaken many enterprises in South Africa, he regarded the dividend recommended as fairly satisfactory. Concerning the use of colonial coal, their Manager, at the time of his report, had been working with it for eighteen days; and he found it took 5½ lbs. to do the work of 3·83 lbs. of English coal. Mr. Ford calculated that by this change they would save 25 per cent. in the expenditure, which would amount to something like £2500.

Colonel GRAHAM remarked that in the prosperous years of the Company, the Directors had been content to add £2000 to depreciation and reserve; while now, when the year had not been so successful, they were proposing to place £8077 under those heads. He should therefore move, as an amendment to the motion, that instead of this sum being disposed of as suggested, a dividend be paid for the past half year at the rate of 10 per cent. per annum, and that the balance of £202 be carried forward.

Mr. FINLAY seconded the amendment.

Mr. JACKSON said that the argument which Colonel Graham used against the Directors' proposal was the very one which induced them to make it. It was because the past year had not been so prosperous as previous ones that they thought it prudent not to divide the profits so closely as had been done on former occasions.

It was elicited by Mr. Finlay, in the course of further discussion, that the reserve fund was invested in the business; and therefore the amendment could not be carried out even if adopted. Colonel Graham, however, insisted that it should be put to the vote; and on this being done, it was negatived, and the original motion carried.

Resolutions were next passed declaring the dividend recommended, and re-electing the retiring Directors and the Auditors.

An Extraordinary General Meeting was then held for the purpose of considering, and, if thought fit, passing the following resolution: "That the Directors be empowered to borrow money to the extent of £110,000 by the issue of debenture stock, either perpetual or terminable, and carrying interest at such rate, not exceeding 6 per cent. per annum, as the Directors shall determine, and to be constituted and secured in such manner as the Directors may think expedient." It was explained that the Board proposed to create this debenture stock (to be repayable at par at the expiration of 50 years) with a view of relieving the Company of the annual burden of paying off the 1-18th part of the existing debenture debt, and for other purposes. Of the £110,000, £32,000 would be first issued, and the balance would be issued only against the exchange of old debentures for the new debenture stock, or for the payment of old debentures annually drawn.

After considerable discussion, the resolution was carried; and it was agreed that applications for the stock received from shareholders should have first consideration.

The proceedings terminated with the usual complimentary vote to the Directors.

The Deacon Waste-Water Meter.—In the JOURNAL last week we noticed the recent decision of the Skipton Local Board to adopt some of Deacon's waste-water meters in that town. We now learn that a similar decision has been come to at Darwen.

BRUSSELS MUNICIPAL GAS SUPPLY.

Gas Committee's Report for the Past Year.

The report of the Gas Committee of the Municipality of Brussels, on the working of the gas undertaking during the twelve months ending Dec. 31, 1890, was presented to the Municipal Council at their meeting on the 6th inst. Its chief features of interest will be found in the following abstract translation.

The total quantity of gas produced during the past twelve months amounted to 25,939,640 cubic metres, or about 916 million cubic feet; being an increase of 1,117,510 cubic metres, or 39½ millions, on the make in the previous year. It was disposed of as follows:—

	Cubic Metres.
Night gas, at 15c. per cubic metre	15,646,254
Day gas, at 10c.	2,328,722
Municipal establishments, at 10c.	815,220
Gas-engines, at 10c.	714,469
Industrial purposes, at 10c.	155,671
Illumination devices, balloons, &c.	152,363
Artizans' dwellings and miscellaneous	66,672
Total sold.	19,879,371
Public lighting and illuminations	3,954,149
Used on the works, &c.	764,011
Unaccounted for	1,306,109
Total output.	25,903,640

The total sales of gas increased last year by 537,158 cubic metres, or 2·78 per cent.; but the rise was chiefly in day gas, as the consumption of night gas was about the same as before—15,646,254 cubic metres, as compared with 15,615,426 cubic metres in 1889. The loss of gas by leakage amounted to 1,306,109 cubic metres, or 5·04 per cent. of the output, against 1,028,421 cubic metres, or 4·14 per cent., in 1889. This is a change as compared with the past few years, the figures for which have shown a marked decline; but the increase is accounted for by the loss resulting from ruptures of pipes which occurred during the frosty weather prevailing towards the close of the year. The number of meters in use on Dec. 31, 1890, was 13,838 (an increase of about 500), of which 6588 were double-index meters. The Municipality follow the practice of the Paris Gas Company in gratuitously fixing rising pipes to the houses, to convey the gas to the upper storeys; and last year 169 of these were provided—bringing the total number up to 643. It is expected that very shortly all the houses which are let out in "flats" will be fitted with pipes of this kind. The efforts already made by the Committee to extend the use of gas for other than illuminating purposes were continued last year; and at its close they had out on hire 1669 gas appliances of various kinds employed in culinary and domestic operations. Not content, however, with the success they have achieved in this direction, they have been endeavouring to develop the construction of stoves specially adapted to the requirements of the Belgian *cuisine;* and they expect before long to be in a position to submit to the notice of the consumers a cooker with which either gas or coke may be used. They believe an appliance of this character will prove a great success. The employment of gas for motive power advanced favourably in the past twelve months as compared with 1889. In that year, the Committee had only a single additional gas-engine to supply; whereas last year the number was increased by 19—the consumption of gas showing a corresponding rise from 632,812 to 714,469 cubic metres. The total number of motors running at the end of 1890 was 174, representing 577-horse power. With regard to the other purpose for which gas is used in the city—viz., public lighting—it still holds its position as the principal illuminant, although the electric light has been installed in certain places, and a general scheme of lighting by this system is now being prepared. At the close of last year there were in use 5438 gas-lamps, as against 5367 at the end of 1889. Of the total number, 322 were furnished with high-power burners, and 631 were extinguished after midnight. It is scarcely necessary to mention that whenever repairs are required in the lanterns, their construction is modified so as to obtain as great a quantity of light as possible. In this way the lighting of the streets is materially improved without appreciable expense.

Coming to the manufacturing operations, the Committee had, like all other suppliers of gas, to submit to a very serious additional burden when they renewed their coal contracts last June; the price of their raw material having increased to the extent of 50 per cent. The effect of this will, of course, be seen in the accounts for the current year. Nor was this all. The difficulty of the situation was aggravated by the fact that the quality of the coal changed in inverse ratio to its price. Then the prolonged interruption of navigation which occurred during the severe weather of the winter entailed considerable expense for the transport of coal coming from abroad. The average price per ton of raw material carbonized last year was 18 frs. 58 c. per ton; whereas in 1889 it was only 14 frs. 64 c.; and in 1888 only 13 frs. 5 c. The quantity used was 93,526 tons. Notwithstanding the rigorous winter, the stock of coke was not cleared off to any extraordinary extent. The retail sales were nevertheless about 251,000 bushels in excess of those in 1889. The breeze, mixed with pitch, was utilized in the manufacture of compressed fuel, of which about 20,522 tons were produced, and used for heating the furnaces.

The financial part of the report shows that the expenditure charged to capital account last year was 228,312 frs., of which 120,123 frs. were paid for a site for new works. These have been called for by the increased consumption. During the past few years the productive power of the works has been raised to 30 million cubic metres of gas per annum; but seeing that the make last year, as already stated, was practically 26 millions, they will soon be unequal to the demands upon them. Plans for new works, to adjoin the existing ones, have been prepared, and will shortly be submitted to the Municipal Council for their approval. A commencement will probably be made in the course of the current year, so that the plant may be brought into operation before the winter of 1893. The total amount sunk in the gas undertaking on Dec. 31 last was 14,455,099 frs. (£578,204). The above-mentioned sum of 228,312 frs. does not comprise the whole of the outlay on the works last year, as certain expenses were, as before, defrayed out of revenue. The following are the principal items in the expenditure and revenue accounts:—

Expenditure.

	Francs.		Sterling.
Manufacture—			
Coal and other carbonizing material.	1,740,795	..	£69,632
Purifying materials	6,019	..	241
Engine fuel, &c.	81,523	..	3,261
Salaries and retort-house charges	285,345	..	11,414
Transport of material	122,256	..	4,890
Maintenance of works and plant.	316,715	..	12,669
Contribution to workmen's fund.	5,233	..	209
Miscellaneous	35,077	..	1,403
Distribution—			
Public lighting	90,610	..	3,624
Main and service laying, maintenance, &c.	206,771	..	8,271
Meters, meter repairs, and testing	57,783	..	2,311
Salaries, wages, and workshop expenses	81,279	..	3,251
Contribution to workmen's fund	1,747	..	70
General expenses	1,723	..	69
Contribution to Belgian Association of Gas Managers	8,000	..	320
Office and other expenses	265,586	..	10,623
Total	3,306,462	..	£132,258

Revenue.

	Francs.		Sterling.
Sale of gas	2,773,412	..	£110,937
Do. coke	1,181,151	..	47,246
Do. tar	140,036	..	5,601
Do. ammoniacal liquor	102,985	..	4,119
Do. spent purifying material, &c.	77,588	..	3,104
Meters, services, and fittings	120,311	..	4,812
Miscellaneous	196,594	..	7,864
Total	4,592,077	..	£183,683
Deduct expenditure	3,306,462	..	132,258
Balance in favour of Municipality	1,285,615	..	£51,425

The budget estimates for the year were: Receipts, 4,250,000 frs.; expenses, 2,700,000 frs. So that the estimated surplus of 1,550,000 frs. was not reached by 264,385 frs. It should be again pointed out, however, that certain expenses incurred in extending the distributing system and increasing the value of the works and material, were defrayed out of revenue. These sums, amounting together to 110,144 frs., make the real profit on the year's working 1,395,759 frs. (£55,830). This, however, is a falling off to the extent of 56,588 frs. (£2264) as compared with 1889.

GAS AND ELECTRIC LIGHTING UNDERTAKINGS IN MASSACHUSETTS.

In the JOURNAL for the 7th inst. we gave some particulars as to the testing of gas and gas-meters in Massachusetts in the past year, as furnished by the annual report of the Gas Inspector (Mr. C. W. Hinman). We have now to deal with the annual report of the Board of Gas and Electric Lighting Commissioners of that State (a copy of which, as in previous years, has been courteously forwarded to us by them), which, as usual, contains a mass of statistical and general information in regard to the two classes of undertakings over which they have jurisdiction.

The report now under notice is the sixth which the Commissioners have presented to the Legislature; and it gives the accounts of the various companies for the twelve months ending June 30, 1890. The particulars appear a little late; but this is explainable. The law requires the companies to send in their returns to the Board on or before the second Wednesday in September in each year; but only 27 gas and 15 electric light companies seasonably complied with the provisions of the statute. Last year, 73 gas and 60 electric light companies made returns. As 21 of the gas companies were also engaged in the business of electric lighting, with a probability that the number would increase, the Commissioners deemed it best to issue a form of return adapted to both kinds of enterprise. In their examination of the condition of the companies, the Board found several instances of an unlawful increase of capital stock; and in two cases the shares so issued were called in and surrendered. The cancellation of shares is sometimes a hardship on the owner; and it is always annoying. But the Commissioners point out that the amount of capital stock is usually of vital consequence to the consumers or patrons of a company; and it should be kept at the lowest practicable point, as the best guarantee for cheap light as well as for reasonable dividends. The question of the consolidation of gas and electric light companies was brought before the Commissioners in two strikingly illustrative cases during the period covered by their report—viz., the North Adams and Worcester Gas Companies. In the former case, the prayer of the petitioners was granted; in the latter, it was denied—the Board seeing no valid reason, as stated in the JOURNAL for Jan. 6 last when this matter was briefly noticed, why the two companies could not, working separately, supply their customers quite as satisfactorily as if they were amalgamated. The Commissioners express the opinion that such companies ought not to be allowed to combine unless it is clear that they and the community will benefit thereby, and the consumers not be prejudicially affected. It may be remembered that the Legislature repealed the enactment limiting the quantity of carbonic oxide permissible in gas sent out for consumption. The effect of this has been to remove all legal obstacle to the manufacture of water gas. Before the repeal there was coal gas as well as water gas made in Boston proper, the Charlestown district, Worcester, Fall River, and Spencer. In these places the two gases were mixed. In Amesbury and Cottage City there were only water-gas plants. The companies in Lawrence and Pittsfield have lately added water-gas works; whereas in Athol, where

plant for the manufacture of this gas was formerly used, only coal gas is now made. During the latter part of last year, some of the companies produced a larger quantity of water gas than hitherto, owing to the scarcity of coal.

With regard to electric lighting, the Commissioners remark that, notwithstanding its steady progress, there has been a gradual increase in the consumption of gas in a large majority of places. They point out that it is only by continued observation and numerous practical tests that the comparative cost, value, and various uses of electricity and gas for light can be finally determined; and as yet the cost of gas can be estimated more closely than that of the electric light. They acknowledge that there has been considerable improvement in the returns furnished by the electric light companies, most of whom have shown a desire to perfect their system of keeping accounts. The Board continue to receive inquiries in regard to the real candle power of the different electric lights in use; and they recommend the Legislature to endow them with authority to call in the services of an expert to test the illuminating value of these lights, as such tests would be important, if not indispensable, in cases where the Commissioners are called upon to fix the price of the light. They suggest that the report on the special work of his department made by the State Inspector of Gas and Meters (noticed in the JOURNAL last week) should in future be combined with their own.

A considerable portion of the introductory section of the report is occupied with a record of the proceedings of the Board in what may be called their judicial capacity. Reference has already been made to their decisionsi n the cases of the two companies who wished to "take on" electric lighting—one of them being adverse to the applicants. Another case which came before the Commissioners in which an established gas company succeeded in quashing an attempt to introduce into their district a rival fuel-gas scheme, may be worth recording. It appears that the Mayor and Aldermen of Chelsea City gave permission to the American Fuel Company to lay gas-pipes in certain of the streets; and the Chelsea Gas Company appealed to the Commissioners on the matter. At the hearing, at which all the parties were represented, the Fuel Company claimed that they had already laid their pipes in some of the streets, and that their works were nearly completed. They said they could produce gas by passing steam and crude petroleum, with air under pressure, through hot iron pipes; and they asserted that, after the pipes had been once heated by coal or wood, the manufacture would be continuous—a portion of the gas made being used for fuel. After the works were completed, they were examined on behalf of the Commissioners, and a sample of the gas produced was analyzed by the State Inspector of Gas. This gentleman found that it contained only 14·91 per cent. of illuminants, 10·67 per cent. of marsh gas, 12·52 per cent. of oxygen, 54·76 per cent. of nitrogen, and 4·25 per cent. of hydrogen. Commenting upon these results, he stated that nearly 29 per cent. of the gas came from the oil; while upwards of 69 per cent. was furnished by the air. It was subsequently admitted by the Fuel Company that many radical changes would have to be made in their works before they could be operated successfully; and an enumeration of these showed that when re-modelled the works would be practically new. The failure to exhibit any practical tests, the quality of the gas as shown by the analysis, and the numerous alterations said to be advisable in the construction of the works, led the Commissioners to the conclusion that the process was in an experimental stage, and was unsuccessful; and they expressed the opinion that trials of this nature ought to be made on private lands, and not in public streets. The Gas Company's appeal was therefore sustained, and the permission granted by the Mayor and Aldermen revoked. In another case the refusal of the authorities of Wakefield to allow the Citizens' Gaslight Company of Reading and Stoneham to put up poles and run electric light wires in the streets was overruled by the Commissioners on appeal to them. Having already granted electric lighting powers for the place, they could scarcely do otherwise than support the Company in their desire to carry them out. Electric lighting plant has since been erected at the works of the Gas Company, who have received locations for their poles. There were several accidents, in connection with both gas and electric lighting, in the course of the year; and particulars of these are given in the report.

Coming now to the statistics furnished by the Commissioners, and dealing with the gas undertakings first, we find there were in active operation on June 30 last 70 gas companies, 24 of whom also furnished electric light; and beyond these there were three gas-works owned by private parties. The capital employed ranged from $5000, at Great Barrington, up to $2,500,000, at Boston. The total receipts amounted to $5,270,991, as compared with $4,869,342 in 1888-9; the expenditure, to $3,662,373, against $3,314,338. There was consequently an apparent net profit of $1,608,618. Adding, however, $16,085 received for interest, $151,063 for rents, and $110,871 for electric lighting, the total is brought up to $1,886,637, against $1,689,944 in 1888-9. Out of the receipts there was paid a sum of $144,129 interest on bonds and loans, $1,017,785 for dividends, and $107,243 for various purposes; making a total of $1,269,157, and leaving a surplus of $617,480, against $603,560 on June 30, 1889. Seven of the companies did not earn their expenses; while the profit realized by others was insufficient to warrant the declaration of any dividend. The receipts for gas sold by meter show an apparent increase of about $415,000; but the sales made by the various Boston Companies to each other, and thus counted twice as sold, reduce this amount to about $174,000—still showing a substantial increase in the use of gas. The receipts from the public lamps continue to fall off, owing, the Commissioners conclude, to the increased use of electricity for street lighting purposes. The drop last year was to the extent of $25,000. The total assets of the companies amounted at the date of the last returns to $26,576,266; the liabilities (*plus* the reserve and depreciation funds) to $20,009,250—leaving a surplus of $6,576,016, as compared with $2,009,829 in 1888-9. This large increase—amounting to $4,630,183—is not, we are told, due to any sudden increase in the business of the companies, but to the fact that the Boston Company have added to their construction accounts the sum of $4,064,041, which had been previously charged to expenditure, or written off from construction accounts, and that two other companies had made additions in a similar way. These sums account for 90 per cent. of the apparent increase. The dividends declared ranged last year from 2 to 20 per cent. (the latter in one case only); 6, 8, and 10 per cent. being the general rates. Reductions in price were made by 18 companies, of whom four reduced their figure in 1889, six in 1888, and one in both years. The average price charged for coal gas by 24 companies making annually more than 30 millions each is $1·3946 per 1000 cubic feet; the average of the remaining companies is $2·0152—or $1·4461 over all. The average price of oil gas is $3·8106 per 1000 cubic feet. It may be of interest to give here the average prices of coal gas for previous years: 1886, $1·72; 1887, $1·66; 1888, $1·56; and 1889, $1·45. These figures show a steady gain for the consumer.

Particulars are next given of the quantity of gas made, sold by meter and supplied to the public lamps, used in the works and offices, and unaccounted for. Boston, of course, stands highest, with 1,443,853,281 cubic feet—we cannot say of gas "made," because about 101¾ millions of it was purchased. Of the entire bulk, 1,274,875,664 cubic feet were sold by meter, and 121,843,711 cubic feet, or 8·44 per cent., lost, against 6·75 per cent. in 1888-9. The Bay State (Boston) Company sold by meter (to other companies only) 139,242,970 cubic feet; the Cambridge Company, 107,964,033 cubic feet; the Lowell Company, 216,303,500 cubic feet; the Roxbury Company, 137,975,400 cubic feet; and the Worcester Company, 115,312,200 cubic feet. The percentage of unaccounted-for gas in these companies was: 0·07, 7·40, 4·94, 8·28, and 5·69 respectively. These are the principal coal-gas undertakings. Of the twelve companies supplying oil gas only three sold upwards of a million cubic feet; the others ranging from 54,243 to 961,300 cubic feet. The Bay State Company had an increase of 636·13 per cent. in their sales, as compared with the previous year; the Boston Company, an increase of 6·84 per cent.; the Cambridge Company, an increase of 7·84 per cent.; the Lowell Company, an increase of 12·23 per cent.; the Roxbury Company, an increase of 9·69 per cent.; and the Worcester Company, an increase of 13·57 per cent. The capital invested per 1000 cubic feet of gas sold was highest in the Bay State Company ($35·995) and lowest in the Boston ($1·891). The figures for the four other companies are: Cambridge, $5·901; Lowell, $2·227; Roxbury, $3·542; Worcester, $4·369. The daily capacity of the works of the six companies we have taken is: Boston, 6,000,000 cubic feet; Bay State, 4,000,000 cubic feet; Cambridge and Lowell (also Lawrence), 1,000,000 cubic feet each; Roxbury, 500,000 cubic feet; Worcester, 1,050,000 cubic feet. Some of the other companies in the State have works which are equal to the production of only 2500, 4000, and 5000 cubic feet of gas per diem. With regard to public lighting, the consumption of gas for this purpose was greatest at Boston, where 47,460,264 cubic feet of gas were sold. Roxbury followed with 31,434,822 cubic feet; Dorchester coming next with 22,411,425 cubic feet. The consumption in the other towns in the State ranges from about 14 millions at Brookline down to 7500 cubic feet at Malden. In several places the figures show a considerable drop as compared with the previous year, doubtless on account of the introduction or the extension of electric lighting. The capital invested per mile of main by the coal gas companies was highest at Brockton, $35,329; lowest at Norwood, $2844—the figures running generally from $6000 to $14,000. With the oil-gas companies, the figures range from $4000 to $9000.

Turning to the statistics of working and manufacture, we find the highest returns for residuals were obtained by the Citizens' Gas Company at Quincy, who received by the sale of their products 54·68 per cent. of the cost of the raw material; whereas at Spencer the Company only made 1·81 per cent.—the quantity of coal carbonized being 661 tons in the former, and 744 tons in the latter case. In Boston the return was 40·07 per cent.; in Cambridge, 37·28 per cent.; Lowell, 51·31 per cent.; Roxbury, 40·08 per cent.; and Worcester, 41·41 per cent. Nine of the companies use cannel only as an enricher; fourteen employ it in conjunction with oil and naphtha; and the remainder prefer oil, naphtha, or naphtha residuum. At Boston, 739,338 gallons of naphtha, 945 tons of cannel, and 574 barrels of residuum were used with 116,565 tons of coal; at Cambridge, 54,650 gallons of oil with 10,999 tons of coal; at Charlestown, 48,516 gallons of naphtha with 7561 tons of coal for gas making and the production of water gas; at Worcester, 34,040 gallons of naphtha and 41,637 gallons of oil were used with 9121 tons of coal entirely for making coal gas. It will thus be seen that oil is the enricher mainly relied upon. Particulars are given as to the processes and materials employed by the nine water-gas and ten oil-gas companies. Of the former, by far the largest undertaking is the Bay State Company of Boston, who patronize the Flannery system. They made 140 million cubic feet of gas in the period covered by the report; the material used in the generator being anthracite, and the enrichers crude oil and naphtha. The quantity of fuel dealt with was 3015 tons; 1213 tons of coke being used for producing the steam. Of naphtha, 453,400 gallons were used; of crude oil, 228,581 gallons. Two other large companies are the Fall River and the Worcester—one using the Lowe, and the other the Granger process. Their make was 21,050,700 feet and 22,924,600 feet respectively; the material used being anthracite and coke with petroleum as an enricher in the case of the Fall River Company, and coke only with naphtha as an enricher in that of the Worcester Company. Four of the oil-gas companies use naphtha, and the rest petroleum; the fuel employed being variously anthracite, anthracite and wood, bituminous fuel, coal, coke, and wood alone.

Only a few matters remain to be noticed in the portion of the report dealing with the gas undertakings. First as to the distributing system. During the year 47 companies laid about 54 miles of mains, varying from less than 100 feet to nearly 7 miles. The total number of meters in use on June 30 last was 104,506, representing a nominal capacity of 759,493 lights; being an increase of 3892 meters and 16,712 lights over the number at the close of the previous year. High-power gas-lamps were extensively used by the companies—the Lawrence Company having as many as 226 in service. The total number fixed at the date of the returns was 2226. Gas-stoves are largely patronized. Only the Companies having more than 50 of these appliances out on hire made returns; but their figures total up to 7818—Springfield having 1764 and Lowell 4133. Mention has already been made of the reduction in the quantity of gas supplied for street lighting; and it may now be added that the number of

public gas-lamps shows a greater decrease than has ever before been noted—the net loss being 1776, against 999 in the previous report. The oil-gas companies show, however, a gain of nine, all of them being at Amherst.

The portion of the report referring to the electric light companies will be noticed in a separate article.

THE ESTIMATION OF NITRITES IN POTABLE WATERS.

At the Annual Conference of the Pharmaceutical Society held at Leeds in September last year, a paper on the above subject was read by Dr. J. C. Thresh. It was briefly noticed in our columns at the time; but as the full text of the communication has since been published in the Society's *Journal*, we reproduce it.

Probably no analyst feels that he has carried out a complete examination of a water unless he has at least made a qualitative test for nitrites; and if he finds indications of their presence, he justly regards the water with suspicion, but, uncertain what further inference to draw, a quantitative examination is rarely made. Though this quantitative analysis, therefore, does not seem to be a matter of much importance in the present state of our knowledge, a series of experiments I am now making on the changes in composition of certain waters, by keeping under varied conditions, lead me to believe that ere long the study of these changes will be of great aid in enabling us to judge of the quality of a water, and especially of those waters which at the present time the chemist or the medical officer can only state to be suspicious. One of these changes, and one of the most easily followed, is the variation in amount of nitrous nitrogen. As an example, I will quote that of the most extreme case I have yet met with. A water which, from a mere chemical analysis, would have been passed as "usable," when examined soon after drawing from the pump showed no trace of nitrites. Three days after, it contained no less than 3·5 parts of nitrous nitrogen per litre; and on the sixth day after, it was again free from nitrites. Other changes proceeded *pari passu*; and these, together with a bacteriological examination, proved the water to be seriously contaminated.

It was when commencing this investigation that the want of a simple and reliable quantitative test for nitrites made itself felt. The metaphenylene-diamine and the naphthylamine tests were fairly tried, but did not answer my purpose; neither did titration with potassium permanganate. In working out the process for determining the amount of dissolved oxygen in water which I described early this year in a paper read before the Chemical Society, the action of nitrous acid on potassium iodide in the presence of a varying proportion of free oxygen was determined; and the results led me to believe that, after all, the potassium iodide and starch test for nitrites could be made a reliable colorimetric quantitative one for water analysis. The results of my experiments having this for their object may be summarized as follows:—

1. With the same proportions of acid, starch, and potassium iodide, the rapidity with which the blue tint is developed, and the depth of the tint, varies with the degree of oxygenation of the water.

2. The depth of tint increases with the time that elapses between the addition of the reagents and the observation. This is due to the fact that the nitric oxide liberated is acting continuously as a carrying agent between the oxygen dissolved in the water, and of the air in contact with the surface of the fluid and the hydric iodide, liberating an equivalent of iodine corresponding to the oxygen carried.

3. The effect of temperature is such that comparisons cannot be made unless the fluids are within 2° or 3° of the same temperature. Thus, at 65° Fahr., in very weak solutions, the colour is not developed so rapidly as at 60° Fahr., *cæteris paribus*.

4. With the same proportions of starch and iodide, and in samples fully oxygenated, &c., the coloration varies with the amount and nature of the acid used.

5. The amount of potassium iodide added affects the results considerably. The larger the proportion of iodide, within certain limits, the greater the rapidity of the reaction.

6. The quantity and nature of the starch solution are also factors requiring recognition. If too large a proportion of starch be added, a marked reddish tint, instead of the blue tint, is first developed; and this reaction is still more marked if the starch solution has begun to change by keeping.

7. When all the above factors are constant, then the rapidity with which the blue tint is developed and the depth of tint vary directly with the amount of nitrite present in the water.

I need not trouble you with the account of the numerous experiments upon which these conclusions are based, nor of the further investigation conducted to ascertain how the information so obtained could be made available for rendering the iodine and starch reaction reliable as a quantitative test. I will merely give you now an account of the reagents required and the mode of conducting the analysis which I have found to give the most satisfactory results.

1.—Solution of Starch and Potassium Iodide.

Starch in powder	0·2 gramme.
Caustic potash	1·0 ,,
Potassium iodide	2·0 grammes.
Water	200 c.c.

Add the starch to 10 c.c. of water, and when uniformly diffused add the caustic potash. Dissolve without the aid of heat, and add the remainder of the water and the potassium iodide. Strain or filter. This solution keeps for months without appreciable change. For each determination, 1 c.c. is required.

2.—Dilute Sulphuric Acid.

Pure sulphuric acid	1 vol.
Distilled water	3 vols.

This is the same strength as was used for the permanganate test; and I always employ it for both purposes.

3.—Solution of Sodium Nitrite.

Sodium nitrite	0.493 gramme.
Water	1 litre.

Dissolve 1 c.c. = 0·1 mgr. of nitrogen.

The apparatus required consists of two or more 50 c.c. Nesslerizing cylinders; and the process is as follows: Shake the sample of water vigorously in a bottle only partially filled, to saturate it with air. Pour 50 c.c. into the cylinder, and add 1 c.c. of the starch and iodide solution, and afterwards 1 c.c. of the dilute acid; then stir. Assuming the temperature to be about 60° Fahr., if a dark blue tint develops instantaneously, the water contains more than 1 per million of nitrous nitrogen. If it becomes blue in a few seconds, it contains about 0·1 per million. If it requires more than 10 seconds to develop, it contains less than this amount. If the blue colour appears instantly, the water must be diluted with known proportions of nitrite-free water (saturated with air), until it is found by experiment that the colour takes a few seconds to develop.

With a very little experience, the approximate amount of nitrate present can be ascertained with considerable precision by these simple preliminary experiments. Now prepare a standard solution of sodium nitrite by diluting 1 c.c. of the strong nitrite solution with 200 c.c. of water. Of this weaker solution, 1 c.c. diluted to 50 c.c. corresponds to 0·01 mgr. of nitrous nitrogen per litre.

Measure into the Nessler glasses varying quantities of this dilute nitrite solution and fill up with water. Now take 50 c.c. of the water to be examined (or of the diluted water, if dilution were found necessary), and to each add successively 1 c.c. of the starch and iodide solution and dilute acid, and note how the blue tint develops. If none of the solutions correspond with the water, a fresh series must be prepared. In this way, in a very few minutes the amount of nitrite in any sample of potable water can be easily obtained with a very considerable approach to accuracy.

Since I commenced employing this test, I have analyzed upwards of 180 samples of water, 51 of which contained nitrites, varying from 0·005 to 3·4 parts of nitrogen per million; and I have had no reason to suspect inaccuracy from the interference of other constituents in any single case.

To render the process more intelligible, I will give details of two determinations. Two solutions were prepared for me by an assistant, and marked "A" and "B" respectively.

A.—Fifty c.c. *plus* reagents gave a blue tint in about 10 seconds. It was therefore about the proper strength for estimation. Ten c.c. of the dilute nitrite solution was diluted to 50 c.c., and compared with the sample. The colour seemed to develop a little more rapidly; but the difference was not very marked. Three solutions were prepared by diluting 5, 7, and 9 c.c. respectively of dilute nitrite solution to 50 c.c.

5 c.c. = 0·05 nitrogen per million	too weak.
7 c.c. = 0·07 ,,	,,
9 c.c. = 0·09 ,,	too strong.

Another solution containing 0·08 nitrogen per million was then made, and compared with the sample; the blue tint developed a little more rapidly. The strength was certified to be 0·075 nitrogen per litre. The actual strength was 0·07 per litre.

B.—The original water gave a dark blue instantly.

Diluted to 1-10th, a pale blue instantly.

Diluted to 1-25th, colour developed in a few seconds.

Compared 1-25th with 0·15	too weak.
and with 0·10	little too strong.

Now compared with—

0·08	too weak.
0·09	about right.
0·10	too strong.

0·09 × 25 = 2·25 nitrogen per litre. The actual strength was said to be 2·5 nitrogen per litre.

The following results may also be quoted as fair examples of the accuracy obtainable:—

	Nitrous Nitrogen per Litre. Present.	Found.
1	0·100 per million.	0·100 per million.
2	0·625 ,,	0·650 ,,
3	0·625 ,,	0·625 ,,
4	0·093 ,,	0·095 ,,
5	0·010 ,,	0·010 ,,
6	0·050 ,,	0·050 ,,
7	0·125 ,,	0·130 ,,

The time occupied by a determination is usually about five minutes; the reagents are easily made and preserved; and the necessary conditions easily observed. I can therefore recommend the process to those who may desire at any time to estimate the nitrites in potable waters.

The Fire Risks of Electric Lighting.—In the Chancery Division of the High Court of Justice last week, Mr. Justice Kekewich had before him an application by Messrs. Savory and Moore, the well-known chemists of Bond Street, for an injunction to restrain the London Electric Supply Corporation, Limited, from so carrying on their business as to be a nuisance; the nuisance consisting of the danger from fire to the plaintiffs' premises, where a large quantity of inflammable drugs and other goods are stored, in consequence of the high-pressure system of transmitting electricity used by the defendants. In support of the plaintiffs' case it was stated that a number of accidents had already occurred at the Bond Street works, and that there had been at least one serious fire on the premises. The defendants replied that when the accidents and fire occurred, their property was only temporarily fitted up; but that now the chamber in which the electricity was received at high pressure and converted to a lower pressure was made entirely fireproof, so that under no circumstances could a fire occur again. His Lordship, in the result, directed the action to stand over for three months, with a view to seeing whether or not the defendants will take extra precautions to prevent any danger from fire, or otherwise, arising from the use of the upper portions of their building into which electrical appliances might be introduced.

NOTES FROM SCOTLAND.

From our Edinburgh Correspondent.

EDINBURGH, *Saturday*.

The labour question in a somewhat novel form was before the Works Committee of the Edinburgh and Leith Gas Commission on Monday, in an application by Malcolm Macgregor, a joiner in the Leith works, for permission to leave his work to attend meetings of the School Board, to which he has been elected. Mr. Linton, the Engineer, reported that Macgregor was a good workman, and was able to make up for time taken up at meetings by working during meal hours. There was some discussion over the application; the members from Leith particularly being of opinion that to allow one of their workmen to undertake such duties was wrong, as likely to lead to complications. They did not so much object to the man being a member of the School Board, as to his being sent to London and other places on deputation work, which they considered was a privilege a working man could scarcely expect to be accorded to him. The Committee ultimately resolved to recommend that the permission be granted. It is observable that the opposition to the request came from the Leith members; and their position was quite natural, because to allow a workman to occupy a position of superiority, might interfere with their own dignity. The Edinburgh members are not affected in the same way. But setting aside the question of personal dignity, there is much to be said for their view on public grounds. A workman in the position of this one, might attain power in a community which would prove troublesome to the Commissioners in the event of a dispute arising between them and their workmen. In a question like this, the Commissioners require to act warily. If they decline to grant the man's request, they lay themselves open to reprobation among the working classes. On the other hand, if they encourage such aspirations among their workmen, they may find the movement spreading; and in course of time they may have a staff, not of workmen, but of orators and wire-pullers in their employ. I fancy their best policy would be to grant the present application, but to let it be understood that no others will be allowed.

I am informed that a Leith member of the Edinburgh and Leith Gas Commission proposes to introduce the subject of the staff in the gas-works; the view being that there are too many in charge of departments, and that less superintendence would suffice. It is the belief of this gentleman, I understand, that the cost of production is thereby increased, being higher in the works of the Commissioners than in other works. Whether or not this be so, I am not aware; but if inquiry into the matter is all that is proposed, it can do no harm.

The question of meter-rents came up at the Perth Gas Commission on Monday, when a report was submitted which stated that there are 6578 meters in use belonging to the Commissioners, yielding a rental of £612 10s.; that there are 113 meters in use which consumers have purchased from the Commission, £410 18s. 9d. having been paid for them; that 139 consumers possess meters which they have acquired direct from the makers, the probable cost of which was £1364 17s. 9d., and which, allowing for depreciation, might be worth £1000. To purchase these out of one year's revenue would amount to 3d. per 1000 cubic feet of gas sold. In the opinion of the Gas Treasurer, the most equitable arrangement was the existing one, in which the Commissioners charge a percentage of the cost each year as rental upon the meters belonging to them. The question of what is to be done was remitted to the Works Committee to consider, in the making up of their estimates for the coming year.

Electric light promoters in Edinburgh have received a check, in an incident which has just come to light in spite of attempts at concealment. It has transpired that recently one of the Managers of the Edinburgh Royal Infirmary suggested that the Hospital might be lighted by electricity cheaper than by gas. Another of the Managers, a practical man, was of a different opinion; and a Committee was appointed to consider the question. The Committee consulted with Mr. W. A. Bryson, of Glasgow, who was electrician to the Edinburgh Public Library and the Edinburgh Exhibition of last year; and it is stated that Mr. Bryson's report showed that the cost of electric lighting would be considerably more than double that of gas. Besides, gas would require to be used in the wards during the night when the patients are at rest, as it is not possible to reduce the electric light so as to give the darkness in the rooms which is necessary during the hours of sleep. While the proposal has not been formally rejected, it is not likely to be again heard of.

In Berwick it almost looks as if the community were to be entrapped into a scheme of electric lighting. The Lighting Committee this week reported to the Urban Sanitary Authority that, in considering the question of the lighting of the town, they found that the Gas Company were not disposed to meet them either in price or quality of the gas. They had considered the question of erecting gas-works of their own; but they were of opinion that the electric light was the light of the future, and as immense advances had been made in its application lately, they directed their attention more particularly to it. The Committee had put themselves into communication with several electric light engineers; and the result was that one firm had offered to erect and work an electric light installation for five years at a cost which would only increase the general district rate by 1¼d. per £1 in each half year. The firm would also undertake to supply shops and houses. The public installation would consist of 21 arc lamps of 2000-candle power, and 20 incandescent lamps of 20-candle power each The Board adopted the report, and continued consideration of it—the most sensible thing they could do.

Her Majesty the Queen has given another and a most graceful example of her devotion to the interests of her subjects. Her Highland residence of Balmoral Castle stands on the banks of the River Dee, from which the water supply of Aberdeen is derived. For two years past there have been grumblings and protests on the part of the sanitary authorities of the city of Aberdeen that the river is being polluted by the discharge into it of sewage; and local authorities in the higher reaches of the river have been called upon to put a stop to the alleged pollution. Most of them are moving slowly in the matter; but Her Majesty, without waiting for anything in the shape of a compulsitor, has given instructions to have the sewage system of the Castle arranged so as to obviate the possibility of complaint so far as it is concerned, and workmen are at present engaged in constructing a filtration system upon the most approved method.

From our Glasgow Correspondent.

GLASGOW, *Saturday*.

A special general meeting of the shareholders of the Lockerbie Gas-light Company was held last Monday, when it was unanimously resolved to dispose of the Company's undertaking and works to the Police Commissioners, under the Burghs Gas Supply (Scotland) Act, 1876; the purchase price to be fixed by arbitration.

At the monthly meeting of the Renfrew Town Council, held on Monday night, Mr. Irving took advantage of the Gas Committee's minutes being before the meeting to deliver himself of some rather strong remarks regarding the condition of the gas-works. He said they were in a deplorable state; and that the sooner they tried to do something to remedy matters the better, in the interests both of the Town Council and of the inhabitants, as the gas was at present being forced through the pipes in an almost red-hot condition. He moved that a competent gas engineer be employed to examine the gas-works and report on the subject of increased means of manufacture—say to the extent of 120,000 cubic feet of gas in the 24 hours—with provision for extension, if required, and the necessary storeage accommodation. The motion was agreed to; and it was remitted to the Gas Committee with powers to employ a gas engineer.

The exhibition of gas-stoves mentioned in last week's "Notes" as being held under the auspices of the Kilmarnock Corporation, combined with the cookery demonstrations given by Mrs. Thwaites, of the Liverpool School of Cookery, has turned out to be one of the most important things of the kind ever held in Scotland, outside of Glasgow. It was formally closed last Tuesday evening. Provost M'Lelland presided; and he was accompanied on the platform by a large number of the magistrates and town councillors, the Town Chamberlain, [the Gas Manager (Mr. Fairweather), Mrs. Thwaites, representatives of all the exhibiting firms, and by other gentlemen. The hall was filled with ladies. After apologizing for his absence at the opening, Provost M'Lelland congratulated all concerned on the success of the exhibition. It was creditable to the people of Kilmarnock that they had supported and appreciated it as they had done. Among the principal things that had contributed to the success of the exhibition were the lectures and demonstrations of Mrs. Thwaites. Several ladies who had attended them had told him that they had never before enjoyed lectures on cookery so well. Bailies Lawson and Brown, who were primarily concerned in introducing into Kilmarnock the idea of cooking by gas, having made some very appropriate remarks, Mr. R. Main (of Messrs. R. and A. Main, Glasgow), on behalf of the exhibitors, expressed their pleasure at being able to do something towards making the exhibition what it had been. Mrs. Thwaites thanked the Provost for his commendatory remarks in regard to herself, and the ladies for their kind attention and intelligent appreciation of her lectures.

The cookery lectures and demonstrations in connection with the Glasgow East-end Exhibition came to a close this afternoon, when Miss Burdon, one of the Glasgow lady lecturers on cookery, read an address from the ladies to Mr. H. Darwin, the Managing Director of Darwin and Co., thanking his firm, and himself specially, for their enterprise and great consideration in instituting the lectures in connection with the exhibition. Mr. Darwin, on behalf of the ladies, presented Miss Burdon with a diamond ring as an acknowledgment of her valuable services and a memento of the occasion.

This week's Glasgow pig-iron market has been much under the influence of the operations of the "bears," and prices have fluctuated considerably. Scotch warrants being scarce the early part of the week, were rushed up to 43s. 10½d. per ton, from which, owing to all the immediate wants having been supplied, there was a relapse on Thursday to 42s. 11d. cash. Subsequently, however, there was a good rally, and the market took a peculiar turn at the close yesterday afternoon. On buying orders coming in, the prices all round suddenly jumped up. There were few sellers. Buyers of Scotch offered up to 44s. 1¼d. cash per ton, with sellers wanting ¼d. per ton more. The price offered for Cleveland iron stopped at 38s. 10d. cash, although the last business done was at 38s. 7d. cash. Buyers of hematite iron left off at 48s. 3d. per ton cash. There is a very poor legitimate demand, either for local consumption or for export; and yet this ought to be well-nigh the height of the shipping season. The number of blast furnaces in actual operation has now been increased to 52, as compared with 45 a week ago and 87 at this time last year. Six furnaces are making basic iron, and twelve are working on hematite ironstone.

Instead of improving, the coal trade of Glasgow and the West of Scotland is becoming decidedly worse. Inquiries for coal this week have fallen off so much that, notwithstanding the further reduction in prices, short time is being worked in some of the collieries. Merchants all round report that their order books are light, whereas the opposite should be the case at this season of the year. The Continental demand is slow to make its appearance in the Glasgow market; indeed, it is feared that it has migrated to the North of England. Main coal has been sold this week at a trifle under 7s. 6d. per ton f.o.b.; and sales of ell coal have been made at 8s. 6d. per ton—the general quotation, however, being 9s. per ton. Splint sorts have been freely sold at 8s. 6d. per ton, merchants being anxious sellers.

The Proposed New Main Drainage Scheme for London.—At the meeting of the London County Council last Tuesday, the Main Drainage Committee presented a report with reference to the joint report of Sir Benjamin Baker and the Chief Engineer of the Council (Mr. A. R. Binnie, M. Inst. C.E.), upon the main drainage system of London. They recommended that detailed plans should be prepared of the proposed new sewers on both sides of the river. After some discussion, the following rider was added to the motion for the adoption of the report: "And that the Committee be instructed to obtain a further report which shall have special reference to the separation of the rainfall from the sewage, the better prevention of storm overflows into the Thames and Lea, and the better purification of the river."

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *April* 18.

Sulphate of Ammonia.—Although superficially the market may appear quiescent, because there is no excitement, nevertheless any parcel offered by makers is well competed for, and prices are steadily, though slowly, hardening. £11 5s. has repeatedly been paid at Hull and Leith, and also at Liverpool for good makes; and there is to-day remarkably little offering. With the advance of the London quotations, country producers have gained heart; and it is now questionable whether further parcels would be obtainable even at £11 5s. Sales forward at present values, of which rumours come from Scotland, seem somewhat injudicious, seeing the precarious future of nitrate at the present moment, and which is already reflected in the full prices paid for March to June shipments. The production of nitrate during the first quarter of 1891 is said to be less than half of that last year, during the same period; and at present the quantity required for consumption, based upon last year's figures, is assured till June only. Necessarily, even when the present difficulties are settled, months must elapse before the production and the shipments can be resumed to their full extent. *Ergo*, why should a sulphate manufacturer close forward business, when there are chances in his favour of getting a better value by waiting—the position to-day being such as to preclude a fall? Without saying too much, does it not appear a distinctly favourable feature that Continental consumers are willing to buy for summer delivery at present figures? indicating that they do not look for lower prices.

LONDON, *April* 18.

Tar Products.—This market continues lifeless and uninteresting. Benzols are weaker; and the same remark applies to all the light tar products. Anthracene is also flat; and pitch, though in excellent demand for this season, is not so strong for future shipments. The requirements, however, of this article, are growing so rapidly, that it is not likely to recede much in value. Carbolic acid maintains the slight improvement which has now marked it for several weeks; and it is expected that this product will soon return to its former reasonable value. Creosote and tar oils are somewhat unsaleable, excepting for Lucigen light purposes, which after all is but a small trade comparatively. Nominal quotations are: Tar, 25s. to 30s. Pitch, 30s. to 34s. Benzol, 90 per cent., 4s. 2d.; 50 per cent., 3s. 1d. Toluol, 1s. 9d. Solvent naphtha, 1s. 7½d. Crude naphtha, 1s. 6d. Creosote, 1¾d. Carbolic, 35 crystals, 5½d.; crude, 60's, 1s. 5½d. Cresol, 10d. Anthracene, "A" quality (30 per cent.), 1s. 4d.; "B" quality, 1s.

Sulphate of Ammonia.—Although considerable shipments are taking place, the value of sulphate keeps low, and buyers are continually asking and expecting lower prices. Taking the nitrogen value, it is much cheaper than nitrate of soda. The improvement of the latter article should soon affect the price of sulphate. Business is reported at £11 to £11 5s., less the usual discount. Gas liquor prices are 5s. 6d. to 7s., according to position.

Lancashire Coal Trade.—The demand for most descriptions of coal is fairly good; and last week's rates are fully maintained. There is, however, an absence of briskness about the market, and buyers seem to be simply purchasing for immediate requirements. At the pit's mouth best house coal is quoted at 12s. 6d. per ton, with 10s. 6d. and 11s. for seconds, and 9s. to 9s. 6d. for common round; burgy, 7s. 6d. to 8s. per ton; special qualities of slack, 7s. per ton; commoner sorts, from 6s. down to 4s. 6d. per ton. The inquiry for steam coal for shipment does not show any improvement, and prices are 9s. 6d. to 10s. per ton delivered at the ports on the Mersey.

The Gaslight and Coke Company Fined in Respect of their Cannel Gas.—At the Westminster Police Court, on Monday last week, The Gaslight and Coke Company were summoned by the London County Council for supplying gas of deficient illuminating power at the Millbank Street testing-place on the 9th of October last year. Mr. Roberts prosecuted; Mr. Horace Avory appeared for the Company. On the day in question the gas when tested was found to be 0·6 of a candle below the standard for cannel gas—viz., 20 candles. The Company appealed to the Chief Gas Examiner (Dr. Williamson, F.R.S.) against the return of the District Examiner (Dr. Teede); but they were unsuccessful. Dr. Williamson's report on this reference to him was given in the JOURNAL for the 7th inst. (p. 653); and the Company's explanation will be found fully set forth therein. Mr. Sheil imposed a penalty of 20s., and 23s. costs.

Penmaenmawr Water Supply.—Last week the Police and Sanitary Regulations Committee of the House of Commons had under consideration the Penmaenmawr Local Board Bill. Mr. Balfour Browne, Q.C., and Mr. Malcolm Douglas appeared for the promoters; and Mr. L. Baggallay appeared for the only opponent—Mr. Sudbury. The object of the Bill is to extend the water supply of Penmaenmawr; and the present water-works, which were acquired in 1868, are now insufficient. The watershed is 270 acres in area; and the Board propose a watershed 590 acres in extent, at a higher level than the present, so that not only will the water supply be better, but the sewage works, on which there exists a debt of £8464, will become more effective. It is proposed to tap the River Afon Gyrach, to embank it, and to construct a reservoir to contain a million gallons. The river lower down flows through a glen, called the Fairy Glen, which is much visited by tourists; and Mr. Sudbury, the owner, who makes a small charge for the visit, was the only opponent. It was stated that the scheme would not affect the stream; and at any rate, Mr. Sudbury could only be entitled to a money compensation. The borrowing powers sought for amounted to £7000. Engineering and other evidence having been called in support of, and against the scheme, the Committee offered to pass the Bill on the condition that a sum of £2000 was paid to Mr. Sudbury for any damage done to his glen by abstraction of water from the river by the operations of the Board. A long discussion took place as to the clause which the promoters had prepared in acceptance of the Committee's offer; and it was decided that it should be made clear that the compensation was in respect of the works authorized by the Bill, including the abstraction of the whole of the water from the proposed drainage area and the laying of the conduit-pipes.

Fylde Water Company.—The report and accounts of this Company for the half year ending in February have just been issued. The Directors state that the capital account has been increased by an expenditure of £11,482 (including £1996 in connection with the Company's Bill now in Parliament), which brings up the amount to £257,151. The receipts for the half year were £23,456, including a balance of £1397 from the previous half year; and the expenses, £4018—leaving a balance of £9138, out of which the Directors recommend a dividend on the subscribed stock of 8½ per cent. on "A" shares and 7 per cent. on "B" shares, free of income-tax. A balance of £2344 is carried forward.

The Salary of the Manager of the Huddersfield Corporation Water-Works.—At last Wednesday's meeting of the Huddersfield Town Council, Alderman Brigg moved that the salary of Mr. John Stanway, the Water-Works Manager, should be increased, from Jan. 1 last, from £400 to £500 per annum. The mover spoke warmly of Mr. Stanway's services, and claimed that on that consideration alone he was deserving of an advance; but he added that the Manager would have increased and onerous duties in connection with the Marsden undertaking, on which the Corporation were proposing to spend £200,000, and for these duties alone he ought to receive some recompense. Alderman Crosland seconded the motion, which was opposed by Mr. Brierly, who moved that the advance be not granted. Mr. Moorhouse seconded the amendment. After further discussion, Mr. Brierly said that, owing to the strong preponderance of opinion against his amendment, he would withdraw it—a proceeding which his seconder declined to allow, unless he were given the opportunity of moving an advance of £50 only. This was agreed to; and the amendment was put in that form. Being voted on, however, it was defeated by 28 votes to 14; and the original resolution was carried.

The Affairs of the Stockton and Middlesbrough Water Board.—The accounts of the Stockton and Middlesbrough Water Board for the half year ending Feb. 14 last show the total capital expenditure to be £1,416,072, against which the sum of £1,432,900 has been received from the constituent authorities. The revenue for the past half year exhibits a profit of £25,038; the balance of undivided profit being £13,245. In consequence of a request from the Eston Local Board for information as to when it was expected that the Board would be in a position to afford a supply of water from above the source of pollution at Barnard Castle, the General Manager (Mr. D. D. Wilson) and the Engineer (Mr. J. Mansergh) were asked to report on the position of the new works at Hury and Baldersdale; and this information has now been submitted to the Board. The report states that the work in connection with the flood water channel at Hury will take about six or seven months before it can be completed; and as all the other work which remains to be done in connection with the gravitation scheme can be carried out in this time, it would appear that during the present year the two Teesside boroughs and the other districts served by the Board will be in possession of a plentiful supply of water taken direct from the Balder Valley and far above all source of contamination.

The Electric Lighting of Leamington.—At the meeting of the Leamington Town Council yesterday week, the Town Clerk (Mr. Passman) reported that the Board of Trade had decided not to refuse the applications of the Corporation and the Midland Electric Light Company for Orders to light the borough by electricity. The Board would not, without the consent of the Corporation, grant the Company an Order while refusing one to the Corporation. He had informed the Board that they would not take an Order involving the purchase by the town of any portion of the Company's existing plant. The Board of Trade's ultimatum was that they would grant an Order to both parties, without any condition as to the purchase of the plant. The Town Clerk recommended the Council should insist on the insertion of a clause in the Company's Order determining the agreement previously existing between them. Mr. Crowther Davies moved that the Corporation abandon their application for an Order; and he expressed his gratification at the prospect of the ratepayers being saved the expense of a risky experiment. The Corporation had got rid of the Midland Electric Light Company, and would take care that in future they should not get anything beyond fair play. The motion having been seconded, the Mayor said he was not at the birth of the electric light in Leamington; but he was very glad to be at the death and funeral. The proposition was carried unanimously. Previous to the meeting the Council received and referred to a Committee a strong memorial rom ratepayers against their proposal to supply electricity.

The Extension of the Reading Water-Works.—On two or three occasions in the last volume of the JOURNAL, paragraphs appeared relating to the proposals for extending the Reading Corporation Water-Works. In order to carry out the extensions, the Corporation have made application to the Local Government Board for power to raise £35,000; and this has formed the subject of an inquiry recently by two of the Board's Inspectors (Mr. S. J. Smith and Mr. E. P. Burd). The Town Clerk (Mr. Day) gave a brief historical account of the water-works; stating that Reading had always been supplied with water from the Kennet, and works for that purpose had been established of a more or less perfect kind during the past 200 years or more. The Corporation had come to the conclusion that they could not do better than retain the Kennet as the source of supply. The filtration was at present insufficient; but the quantity of water available was practically without limit. For some years past, there had been a strong feeling that with regard to the pumping power and the filtering area, and to incidental works, there was a great necessity for improvement; and the Corporation had ultimately determined on a scheme proposed by the Water Manager (Mr. A. T. Walker, M. Inst. C.E.), and approved by Mr. Oswald Brown, M. Inst. C.E. Mr. Walker then explained in detail the proposed new works; mentioning among other things that a subsidence reservoir was very desirable to enable them to tide over flood times. Mr. Smith intimated that it would be necessary to have an additional subsidence tank capable of holding 20 million gallons of water; and he suggested that the Corporation should make application for the authorization of a loan of £50,000 instead of £35,000. Mr. Walker estimated that the cost of this reservoir would be from £10,000 to £15,000. At the termination of the inquiry, the Inspectors visited the water-works.

Compensation for an Electric Lighting Company.—In order to extend their system at Rochester, the South-Eastern Railway Company require the premises of the Chatham, Rochester, and District Electric Lighting Company; and the Under-Sheriff of Kent (Mr. J. Brennan) and a jury have held two sittings for the purpose of assessing the amount of compensation to be paid to them. It appears that they have spent on the plant, buildings, and a well £7456. It was estimated that the value of the plant that could be removed was £2500, and that it would cost about £5000 to reinstate the works, besides which there would be a loss sustained by the interruption in the development of the business. For the Railway Company it was held that £4000 would place the Company in a much better position than they were in now. After considerable deliberation, the jury awarded the claimants £7000 compensation.

Northern Coal Trade.—Trade is steady, and there is still a strong inquiry both for best steam and gas coal; and the expected early opening of the Baltic will add to that demand. Best Northumberland steam coals are 12s. per ton, free on board; and the collieries have considerable orders in hand. Small steam coals are also more in request for steamships' use, and command 5s. per ton. In gas coals there is a large foreign business; while The Gaslight and Coke Company's contract is beginning to create considerable interest. There are various rumours as to the rates at which tenders will be sent in; but it seems to be thought that about 9s. per ton may be the figure. There is no doubt of the fact that many of the largest collieries have their output fairly well sold for some months to come, and at better prices than that named; but the contract is, of course, too important to be neglected. In a fortnight, however, a better idea of rates may be formed. Bunker and household coals are flat. Coke is steady.

A Claim in Respect of "Improved" Gas-Burners.—At the Bolton County Court last Wednesday, an action was heard in which Messrs. T. Nuttall and Sons, a local firm of cotton spinners, sought to recover the sum of £2 8s. from Messrs. J. Lever and Sons, illuminators, of Oldham. Plaintiffs' case was that in August last a member of the defendants' firm called at their mill and showed a so-called improved burner, which was not only to give a much better light than those in use, but do this without any increase in the consumption of gas. An illustration took place on the spot; and an order for two gross was given on the understanding that the burners were as represented. In due course they were forwarded, and Mr. J. Nuttall, the senior member of the firm, took them down to the gas-works to be tested. It was then found that they consumed 50 per cent. more gas than those in use at the mill; and accordingly defendants were written to on the subject. Mr. J. Lever went over and wished to substitute another and smaller burner; but this was refused, and the return of the £2 8s. paid for the burners demanded. Subsequently the defendants forwarded two gross of burners of smaller size; but they were at once sent back. It was contended for the defence that the firm had been unreasonable, and that, had they been disposed, satisfaction would have been given. The test at the gas-works was disputed; and evidence in support of the burners being as represented was offered in the shape of repeat orders from large firms. This, however, was ruled inadmissible. In the end, the judge found for the plaintiffs, on the ground that the burners were not as represented.

Dissatisfied Gas Consumers at Middlesbrough.—At the meeting of the Middlesbrough County Council last Tuesday, the presentation of the minutes of the Gas Committee was followed by a certain amount of the grumbling which is not unfrequently heard from consumers, although it is usually inflicted upon a gas company, or their representatives, and not upon a gas-supplying local authority. Mr. M. W. Prior complained that a great deal of dissatisfaction existed in the town in regard to the quality and price of gas. From a number of bills for the past quarter he had before him, he found that the amounts had increased something like 57 per cent. as compared with the corresponding three months of last year. He thought this showed that they had a lot of air, or something else, blown through their meters. He proposed that the minutes be not confirmed. Mr. Mardon seconded the proposition; saying his experience was that the less gas he burned, the more he had to pay for it. Mr. Brewster thought the increase in the bills must be due to the fact that the amount of gas consumed was better looked after now than it was by the previous Manager. Alderman Archibald said people had been crying out for more pressure, and they had it; and now they were grumbling because they had to pay for the extra quantity of gas consumed. Mr. Jones charged the distributing system with being defective. He said they ought to have larger mains, and keep the pressure as low as possible. Alderman Bell, Chairman of the Gas Committee, in reply, said he believed much gas was needlessly consumed because people did not take the trouble to use fresh burners. The consumption of gas had increased just 10 per cent. and the number of consumers had augmented in precisely the same ratio. Thus the average consumer had the same quantity of gas supplied as in any preceding quarter. As to its quality, the gas-works were doing better than they had ever done before, and were sending out gas of 25 per cent. higher illuminating power than the statutory requirements. The Committee had the whole matter under consideration; and the ratepayers would probably soon be called upon to sanction a large expenditure upon both manufacturing and distributing plant. Mr. Prior said he was satisfied with the explanation, and would withdraw his proposal. He was convinced the Committee were doing all in their power to afford an efficient supply of gas to the town. We think there is not much doubt about this; and their efforts are being ably seconded by the Engineer and Manager (Mr. David Terrace), although they do not appear to be appreciated by the ratepayers. As an instance, it may be mentioned that, a few months ago, Mr. Terrace issued something like 700 leaflets containing useful hints to gas consumers, and informing them that a room had been fitted up at the gas-works with samples of the most modern gas appliances, which would be open to inspection free. It will scarcely be believed that less than a dozen availed themselves of this opportunity of increasing their knowledge in regard to gas matters. Yet, through their representatives on the Council, they blame the Gas Committee for defects for which possibly they are themselves solely responsible.

The Argentine Government and the Buenos Ayres Water-Works.—Arrangements which have been pending for some months between the Directors of the Buenos Ayres Water Company and the agent of the Argentine Government (Dr. Plaza), with the view of the works being taken over by the authorities, in consequence of the financial embarrassment into which the Republic has been plunged, have now been completed; and, according to *The Times*, nothing now remains but to affix the signatures of the parties to the documents which have been drawn up. It appears that ten of the Company's £10 preference shares will be exchanged for £100 of 5 per cent. Government stock.

The Quality of Gas at Heywood.—One of the members of the Gas Committee of the Heywood Corporation (Mr. T. Ainsworth) has lately found himself at issue with his colleagues on the subject of the quality of the gas, as well as on that of a proposed expenditure on additional storeage room. Mr. Ainsworth holds that, in making and supplying "poor and impure" gas, the Committee are acting in direct opposition to the true interests of the ratepayers and gas consumers. He also thinks that if good gas were manufactured, the requirements of the town in point of quantity would be reduced to such an extent as to make the present storeage capacity sufficient for some time to come; thus rendering any further expenditure of capital unnecessary now. Mr. Ainsworth set forth his views in a letter which came before the Town Council at their last monthly meeting; and he concluded by tendering his resignation as a member of the Committee. Some reluctance was shown to its acceptance; and the ex-Mayor (Mr. D. Marlor) expressed the hope that Mr. Ainsworth would reconsider the matter. Mr. Ainsworth said it was not simply quality, but light, that people wanted; and if the Committee improved the quality and the lighting power of the gas, they would not need to increase their plant. He had nothing to complain of in the management, which he thought was done conscientiously and well. It was purely a question of the quality and lighting power of the gas upon which he had resigned; and he could not withdraw. Mr. Lawton remarked that the consumption of gas for heating and cooking purposes had greatly increased of late; but if the quality were raised to 22 candles, people would not be able to afford to pay the increased price for the gas used for such purposes. Eventually the resignation was accepted.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 733.)

Issue.	Share	When ex-Dividend.	Dividend or Div. Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investments.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	10 Apl.	10½	Alliance & Dublin 10 p. c.	10	16–17*	..	6 3 6
100,000	10	,,	7½	Do. 7 p.c.	10	11½–12½*	..	6 0 0
500,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	107–109	+1	4 11 9
100,000	20	27 Nov.	8	Bahia, Limited	20	13–15	..	10 13 4
200,000	5	13 Nov.	7½	Bombay, Limited	5	6¾–7¼	..	5 3 5
40,000	5	,,	7½	Do. New	4	5–5⅜	..	5 9 1
380,000	Stck.	26 Feb.	12½	Brentford Consolidated	100	215–220	+3	5 11 4
125,000	,,	,,	9½	Do. New	100	157–162	+2	5 14 2
220,000	20	12 Mar	11½	Brighton & Hove Original	20	40–42	..	5 9 6
320,000	20	10 Apl.	11½	British,	20	43–45*	..	5 0 0
50,000	10	12 Mar.	11	Bromley, Ordinary 10 p. c.	10	18–20	..	5 10 0
39,000	10	,,	8	Do. 7 p. c.	10	13–15	..	5 6 8
328,750	10	13 Nov.	6	Buenos Ayres (New) Limited	10	10–11	..	5 9 1
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	100–103	..	5 16 7
150,000	20	26 Feb.	8	Cagliari, Limited	20	25–27	..	5 18 6
550,000	Stck.	10 Apl.	13½	Commercial, Old Stock	100	255–260*	..	5 5 9
130,000	,,	,,	10½	Do. New do.	100	194–199*	..	5 8 0
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	121–126	..	3 11 5
557,320	20	30 Dec.	13	Continental Union, Limited	20	48½–49½	..	5 5 0
242,680	20	,,	13	Do. New '69 & '72	14	33–34	..	5 7 0
200,000	20	,,	10	Do. 7 p. c. Perf.	20	37–39	..	5 2 6
75,000	Stck.	25 Mar.	10	Crystal Palace District	100	195–205	..	4 17 7
486,000	10	23 Jan.	4†	European, Limited	10	19½–20½	..	—
354,050	10	,,	4†	Do. Partly paid	7½	14–15	..	—
5,470,630	Stck.	12 Feb.	13	Gaslight & Coke, A, Ordinary	100	240–244	..	5 6 6
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	96–99	..	4 0 10
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	252–257	..	3 17 9
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118–123	..	4 1 3
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	174–179	..	4 3 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	160–164	..	4 5 4
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	250–255	..	3 18 5
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	150–155	+2	3 17 5
1,061,150	,,	12 Dec.	4	Do. 4 p. c. Deb. Stk.	100	113–118	..	3 7 10
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	122–126	..	3 11 5
908,000	,,	,,	6	Do. 6 p. c. do	100	165–170	..	3 10 6
3,800,000	Stck.	13 Nov.	12	Imperial Continental	100	231–238	+2½	5 0 10
75,000	5	12 Dec.	6	Malta & Mediterranean, Ltd.	5	5–5⅜	..	5 9 1
560,000	100	1 Apl.	5	Met. of Melbourne, 5p. c. Deb.	100	110–112	..	4 9 3
541,920	20	27 Nov.	6½	Monte Video, Limited.	20	19–20	+½	6 10 0
150,000	5	27 Nov	10	Oriental, Limited	5	8¾–9¼	..	5 8 1
60,000	5	25 Mar.	7	Ottoman, Limited	5	4–5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited.	10	3¾–4¼	..	—
420,000	100	3 Nov.	6	People's Gas of Chicago— 1st Mtg. Bds.	100	95–100	..	6 0 0
500,000	100	1 Dec.	16	2nd Do.	100	93–98	..	6 2 5
150,000	10	10 Oct.	10	San Paulo, Limited	10	16–17	..	5 17 8
500,000	Stck.	26 Feb.	15½	South Metropolitan, A Stock	100	282–287	..	5 8 0
1,350,000	,,	,,	12	Do. B do.	100	237–242	+2	4 19 2
166,500	,,	,,	13	Do. C do.	100	240–250	..	5 4 0
678,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	140–145	..	3 9 0
60,000	5	12 Mar.	11½	Tottenham & Edm'nton, Orig.	5	11–13	..	4 8 5
				WATER COMPANIES.				
729,221	Stck.	30 Dec.	10	Chelsea, Ordinary	100	260–270	..	3 14 1
1,720,560	Stck.	10 Apl.	8	East London, Ordinary	100	208–213*	−2	3 15 1
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	140–145	..	3 2 0
700,000	50	12 Dec.	9	Grand Junction	50	116–121	..	3 14 5
708,000	Stck.	12 Feb.	10½	Kent	100	265–275	..	3 16 4
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	244–249	−4	3 16 3
406,200	100	,,	7½	Do. 7½ p. c. max.	100	197–202	..	3 14 3
260,000	Stck.	25 Mar.	4	Do. 4 p. c. Deb. Stk.	100	118–123	..	3 5 0
500,000	100	12 Feb.	12½	New River, New Shares	100	355–360	..	3 7 4
1,000,000	Stck.	28 Jan.	4	Do. 4 p. c. Deb. Stk	100	125–128	..	3 2 6
902,300	Stck.	12 Dec.	7	S'thwk & V'xhall, 10 p. c. max.	100	170–180	..	3 17 9
126,500	100	,,	7	Do. 7½ p. c. do.	100	165–170	..	4 2 4
1,155,066	Stck	12 Dec.	10	West Middlesex.	100	255–265	..	3 15 6

*Ex div.

† Interim dividend.

The South-East Essex Water Company's Provisional Order.—This Order was published last Thursday. It provides for the construction and maintenance of works within the parishes of Rochford, Rayleigh, Leigh, and Hockley, subject to the passing of a confirmation Bill. The amount of the capital is not to exceed £18,000; and the borrowing powers are limited to one-fourth of the amount actually raised by the issue of shares or stock, and no higher interest than 5 per cent. per annum is to be paid for borrowed money. The Company must, on demand, supply water for domestic purposes on a scale commencing at 8s. 8d. a year where the rateable value of the premises is less than £5; 8 per cent. where it exceeds £5 and does not exceed £20; and decreasing to 6 per cent. where the rateable value exceeds £80.

Alleged Theft of Gas.—At the Lambeth Police Court last Thursday, Mr. G. R. Hughes, a printer, carrying on business at No. 13, Queen's Road, Peckham, was summoned, at the instance of the South Metropolitan Gas Company, for having altered certain fittings belonging to them without their consent. Mr. T. Day, a collector in the Company's service, stated that on March 1, the gas was disconnected from the premises, and the state of the meter taken. On the same evening he happened to be passing, and observed the gas burning in the passage; whereupon he gave information to the Company. An inspector in the employ of the Company stated that on March 20 he was sent to the defendant's with instructions to cut off the gas. He went inside the premises and found the gas had been connected by the inlet being put back into its original position. The meter showed that 600 cubic feet of gas had passed through it since the supply was cut off. Mr. Philcox, for the defendant, said the business had been assigned to a trustee, and Mr. Hughes was under the impression that the bill had been paid. He was the printer of a newspaper, and gas was necessary to work the machinery. Mr. Hopkins said the offence was a serious one; and he fined the defendant 40s. and 10s. 6d. costs.

A Water Company and their Customers' Liability.—Mr. F. J. Phillpott, house agent, of Ilford, was summoned last Wednesday before Mr. Tabrum, at the Stratford Police Court, at the instance of the South Essex Water Company, to answer charges of unlawfully making alterations to a connection of the service-pipe, at No. 28, Queen's Road, Ilford, and fixing a pipe to the main belonging to the Company, without consent, on the 7th ult. Mr. Monkland conducted the prosecution; Mr. G. H. Young appeared for the defendant. Mr. Monkland stated that the defendant was the agent to the owner of the house in question, and on the 20th of February the Company received a post-card asking for a man to be sent to the house, as a pipe had burst. It was suggested that this was the main-pipe. A man went down the following day, and he found that it was a service-pipe that had burst under the pathway. The defendant was informed, and he wished a tradesman to thoroughly repair it; but as a stopcock connected with the main was found broken, he would not do it. The defendant wrote again about the 3rd of March; and the Secretary to the Company then informed him that he must pay 12s. for the repair of the stopcock. Then followed some abusive letters from the defendant, who procured a tradesman who fixed the connection of the service-pipe. Several witnesses were examined; and after a long hearing, Mr. Young said his client was not aware that he had broken the law, and if he had he would not do so again. Mr. Monkland observed that he only asked for a small penalty. The Magistrate said, as a matter of law, a technical offence had been committed. A fine of 20s. and 9s. 6d. costs was imposed.

Gas Exhibition and Cookery Lectures at Rochester.—Under the auspices of the Rochester Gas Company, an exhibition of gas cooking and heating stoves and other appliances, made by Messrs. T. Fletcher and Co., was opened last Tuesday, in the Corn Exchange, Rochester, and was continued till Friday. Mr. W. Syms, the Secretary and Manager of the Company, opened the exhibition with a few well-chosen remarks, and then introduced Miss A. Kelman, who had been engaged to deliver a course of cookery lectures. These were given each afternoon and evening, and were thoroughly appreciated by crowded audiences. At the close of the lecture on Friday, Mr. Walter Hole, the Company's Assistant Outdoor Superintendent (by whom all the general arrangements were carried out), fittingly closed a very successful exhibition by tendering, on behalf of the ladies present, their hearty thanks to Miss Kelman for the kind and sympathetic manner in which she had conducted her lectures, explained difficulties, and answered the frequent questions put to her. Miss Kelman briefly responded; thanking her audience for the way in which they had assisted her to make the lectures successful by the close attention they had displayed throughout the course.

The Oystermouth Local Board and the Payment for an Artesian Well.—In the Queen's Bench Division of the High Court of Justice last Wednesday, a case was argued before Mr. Justice Day and Mr. Justice Lawrance, sitting as a Divisional Court, in which the Oystermouth Local Board appealed against a decision given in the Swansea County Court. Mr. Bonsor, for the appellants, explained that the plaintiff (Mr. Legg) sued the Board to recover £65 7s., the expense of sinking an artesian well, and preparing an estimate for the water supply of the district; and the County Court Judge gave judgment in favour of plaintiff. The Board admitted that the work was done, and that the price was reasonable; but they were advised that they had no authority to order the work to be done, and that if they paid for it out of the rates it would probably be disallowed by the Auditor. In 1879 a Company obtained a Provisional Order empowering them to supply water to the Oystermouth district; but for the last few years there had been great complaints that the supply was insufficient. In December, 1889, the Company gave notice that after the 26th of that month they would cease to supply water for the present. Then it was that the Board ordered the work which the plaintiff executed; but his (Mr. Bonsor's) contention was that, under the 51st and 52nd sections of the Public Health Act, they had no power to take steps with the view of constructing water-works until they had ascertained that the Company were not able and willing to supply water. There appeared to be a dispute between the Board and the Company; and he submitted that under the Act the dispute ought to have been referred to arbitration; and that there having been no arbitration, what had been done was *ultra vires*. Mr. Justice Lawrance pointed out that the notice which the Company gave showed that they were not able and willing to continue the supply; and if that were so, the Board had power to do what they did. Mr. Bonsor said if this were so, there was an end of the case. The Company, however, resumed the supply in the following April, and had not only continued it up to the present time, but had applied to Parliament for increased powers. Mr. Justice Day remarked that the Act was intended to protect water companies in the possession of their monopoly, and not to protect Local Boards against the just claims of their creditors. Their Lordships held that the decision of the County Court Judge, in favour of the plaintiff, was right; and the appeal was therefore dismissed with costs.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

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TELEPHONE No. 2698.

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HYDRAULIC AND GAS ENGINEERS,

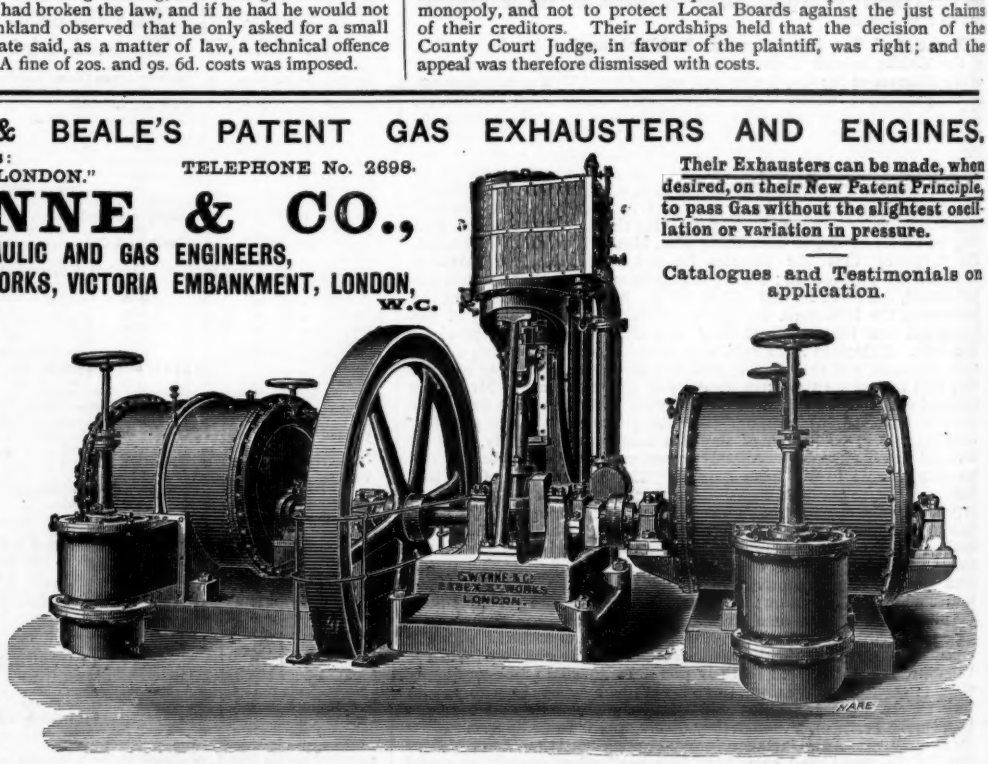
ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co. for Gas Exhausters, &c.

They have completed Exhausters to the extent of 29,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.



Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

Catalogues and Testimonials on application.

Exhausting Machinery at Fulham and Bromley Gas-Works—each set passing 400,000 cub. ft. per hour, drawing 14 miles distant from Beckton.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
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JOHN WM. O'NEILL, Managing Director.

ANDREW STEPHENSON, Agent for the GAS PURIFICATION AND CHEMICAL COMPANY, Ltd., Palmerston Buildings, LONDON, E.C.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
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JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEAR DALKEITH, }

SADLER AND CO., LIMITED,
MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 85, Gracechurch Street, LONDON; 70, Wellington Street, GLASGOW; 58, Fountain Street, MANCHESTER; and 96, Reade Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

TAR and Liquor wanted.
BROTHERTON AND CO., Commercial Buildings, LEEDS.

WANTED, a Situation as Working MANAGER in a Gas-Works making from 7 to 20 million cubic feet per annum. Has had good practical experience in Carbonizing, Fitting, Main and Service Laying, Reading and Testing Meters, and Repairs connected with Gas Plant. Good testimonials and references. Abstainer. Married.
Address No. 1928, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

REQUIRED for a Foreign Gas Company, an OUTDOOR INSPECTOR. Thorough knowledge of Meters necessary, and experience in fixing street illuminations.
Apply, by letter, to No. 1941, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

UTTOXETER GAS COMPANY.

WANTED, a Trustworthy, Capable Man as GAS-FITTER and MAIN and SERVICE LAYER. One who understands repairing meters preferred. Wages 32s. per week.
Address, with copies of testimonials, W. MURRAY, Manager.

WANTED, a steady and trustworthy STOKER, used to Engine and Exhauster and Shovel Charging. Wages, 28s. per week.
Apply, stating age and experience, and enclosing testimonials, to T. E. SHADBOLT, Manager, Gas-Works, Grays, ESSEX.

WANTED, a Working Manager for a small Gas-Works making about a million per annum. Must have a good knowledge of Fitting, laying Mains, Services, &c. House, Coal, and Gas provided.
Apply, in own handwriting, stating wages required and age of applicant, with testimonials, to No. 1939, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by the St. Helens Corporation Gas Department, a GAS-FITTER, used to Stove fixing and Stove-Pipe making.
Applications, stating wages required, and giving references as to character and ability, must be addressed to
SAMUEL GLOVER,
Engineer and Manager.

TO GAS STOKERS.

WANTED, by the Newton Gas Com- pany, a steady and trustworthy GAS STOKER. Must be used to Engine and Exhauster and Shovel Charging. Permanent employment. Eight-Hour Shifts, nine months; Twelve-Hour, three months, yearly. Wages 26s. per week.
Apply, stating age, experience, and giving reference, to J. G. CLARK, Engineer and Manager, Gas-Works, Newton Abbot, DEVON.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON,
Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 765 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 665.
Inquiries should be addressed to THE AUTOMATIC COAL-GAS RETORT COMPANY, LIMITED, 86-88A, LEADENHALL STREET, E.C.

RAILWAY Tanks on Hire.
Address BROTHERTON AND CO., Ammonia and Tar Distillers, LEEDS.

FOR SALE—A Second-hand 8-inch CENTRE-VALVE with CONNECTIONS, complete and in good condition.
For price, &c., apply to the WATER AND GAS COMPANY, LOWESTOFT.

FOR SALE, very cheap—A second-hand patent ROTARY WASHER, in good condition. Capacity, quarter of a million per diem. Also a STATION GOVERNOR of the same capacity.
For price, &c., either as they stand, or overhauled and put in good working order, apply, by letter, to No. 1937, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

HASTINGS AND ST. LEONARDS GAS COMPANY.

FOR SALE, as they stand, Four 20 feet square PURIFIERS complete, with Lifting Gear, Sieves, &c.; also 15-inch CENTRE-VALVE and CONNECTIONS, and a number of 15-inch and 12-inch GAS-VALVES. Thrown out of use, being too small.
CHAS. E. BOTLEY,
Engineer, &c.
Gas-Works, Hastings, April 14, 1891.

FOR SALE—One Gasholder, 43 ft. dia- meter by 14 ft. deep. Capacity 20,328 cubic feet.
One GASHOLDER, 40 ft. diameter by 14 ft. deep. Capacity 17,584 cubic feet.
One Cast-Iron SCRUBBER, 14 ft. high by 3 ft. diameter.
Cast-Iron CONDENSER, 6-inch Connections.
One STATION METER, 2000 cubic feet per hour.
Four PURIFIERS in a Group, 16 ft. by 12 ft. by 3 ft. 9 in. deep; 12-inch Centre-Valve and Connections.
Would erect the above, and make practically equal to new.
Inquiries invited for various second-hand Gas Plant: Gasholders, Tanks, Purifiers, Washers, Exhausters, Station Meters, &c.
Apply to SAML. WHILE (late Ashmore and While), 60, Queen Victoria Street, LONDON, E.C.

ON SALE—Freehold Manufactory in Birmingham, containing about 1600 square yards of land, about one-half of which is occupied by well-built Workshops, Engine, Boiler, and Stack. On a main road nearly central between two Railway Stations, and only a few minutes' walk from either.
Apply, by letter, to No. 1940, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

AMMONIACAL LIQUOR.

THE Henley-on-Thames Gas Company have FOR SALE about 25,000 gallons of AMMONIACAL LIQUOR (strength 10° Twaddel), and will be glad to receive offers for same at per butt, delivered into tank-trucks at Henley Railway Station.
Apply to Mr. W. T. HEWS, Secretary, Gas Company, HENLEY-ON-THAMES.

COAL.

THE Wellingborough Gaslight Company, Limited, are open to purchase 5000 tons of best screened GAS COAL, delivered at Wellingborough (L. & N.W.R.) during the ensuing Twelve months.
Particulars on application.
S. H. KIMBELL,
Secretary.

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application. OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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MANCHESTER ELECTRICAL STORES.

FOR Batteries, Bells, Wires, and Special Electrical Apparatus, address the best house 17, NEWTON STREET, PICCADILLY, MANCHESTER.

SUTTON-IN-ASHFIELD LOCAL BOARD.
(GAS DEPARTMENT.)

TO TAR DISTILLERS AND OTHERS.

THE Gas Committee of the Sutton-in- Ashfield Local Board are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR produced at their Works during the ensuing year.
Particulars may be obtained on application to the Manager at the Gas-Works, Sutton-in-Ashfield, Notts.
Tenders, stating price per ton of 20 cwt. at the Works, or at Sutton-in-Ashfield Railway Station, to be addressed to the Clerk to the Local Board, Local Board Offices, Sutton-in-Ashfield, and marked "Tender for Tar and Liquor," so as to arrive not later than Tuesday, the 28th of April, 1891.
By order,
G. H. HIBBERT,
Clerk to the Committee.
Local Board Offices, Sutton-in-Ashfield, Notts.

SUTTON-IN-ASHFIELD LOCAL BOARD.
(GAS DEPARTMENT.)

SUPPLY OF GAS COAL.

THE Gas Committee of the above Local Board are prepared to receive TENDERS for the supply of 2500 tons of well-screened GAS COAL and 250 tons of CANNEL, to be free from Shale and Pyrites and to be delivered at the Railway Station, Sutton, in such quantities as the Manager shall from time to time direct, between July 1, 1891, and June 30, 1892.
Particulars may be obtained on application to the Manager, at the Gas-Works, Sutton-in-Ashfield, Notts.
Tenders, stating price, to be addressed as above, and marked "Tender for Coal," so as to arrive not later than Tuesday, the 28th of April, 1891.
By order,
G. H. HIBBERT,
Clerk to the Committee.
Local Board Offices, Sutton-in-Ashfield, Notts.

SUTTON-IN-ASHFIELD LOCAL BOARD.
(WATER DEPARTMENT.)

SUPPLY OF COAL.

THE Water Committee of the above Local Board are prepared to receive TENDERS for the supply of 300 tons of Best Hard COAL SCREENINGS, to be delivered at Mansfield Railway Station, in such quantities as the Manager shall from time to time direct, between July 1, 1891, and June 30, 1892.
Particulars may be obtained on application to the Manager, at the Gas-Works, Sutton-in-Ashfield, Notts.
Tenders, stating price, to be addressed to the Clerk to the Local Board, Local Board Offices, Sutton-in-Ashfield, and marked "Tender for Coal Screenings," so as to arrive not later than Tuesday, the 28th of April, 1891.
By order,
G. H. HIBBERT,
Clerk to the Commit ee
Local Board Offices, Sutton-in-Ashfield, Notts.

WINCHESTER WATER AND GAS COMPANY.

TENDERS FOR COAL.

THE Directors of the Winchester Water and Gas Company invite TENDERS for the supply of good COAL suitable for gas making, and yielding, under ordinary working conditions, not less than 10,500 cubic feet per ton of 20 cwt., to be delivered in trucks at the Winchester Station, S.W.R., in such quantities (about 300 tons) from time to time as may be directed, commencing July, 1891.
Requirements: 5000 to 6000 tons per annum.
Tenders, giving full particulars of the description of coal offered, may be sent to me, endorsed "Tender for Coal," on or before the 28th inst.
The Directors do not bind themselves to accept the lowest or any tender.
W. UPTON TINNEY,
Manager.
April 11, 1891.

Price 3s. 6d. post free (76 Pages, Demy 8vo., Limp Cloth),

THE

VALUATION OF GAS-WORKS FOR ASSESSMENT,

By THOMAS NEWBIGGING, M. Inst. C.E.,

With an Appendix containing a Statement of the most Important Cases bearing on the Question, and decided by the Superior Courts. Each of these is preceded by a Digest; and the Judgments are given in full.

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FOR

Gas Engineers and Managers,

BY

THOMAS NEWBIGGING, M. Inst. C.E.

LONDON: WALTER KING, 11, BOLT COURT, FLEET STREET, E.C.

ASHFORD, KENT.

TENDERS FOR COAL.

THE Directors of the Ashford Gas and Coke Company, Limited, are prepared to receive TENDERS for the supply of about 3000 tons of GAS COAL, to be delivered on the Siding at their Works, at Ashford, in equal monthly quantities, from the 1st of July next to the 31st of March, 1892.

Tenders, specifying the description of Coals, the Pits at which they are raised, and terms for net monthly payment, to be sent to me on or before May 1.

F. HUGHES-HALLETT,
Secretary.

Ashford, April 17, 1891.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Victoria New- market Gaslight and Coke Company, Limited, are prepared to receive TENDERS for the surplus TAR and AMMONIACAL LIQUOR produced at their Works during a period of One, Two, or Three years, from the 25th of March last.

Tenders, stating price per 1000 gallons, in Contractor's tanks or barrels, free on Rail at Newmarket, to be sent to the undersigned, on or before the 6th of May next, from whom any further particulars may be obtained.

The Directors do not bind themselves to accept the highest or any tender.

By order,
J. H. TROUGHTON,
Manager and Secretary.

Gas-Works, Newmarket,
April 16, 1891.

TENDERS FOR IRONWORK.

THE Directors of the Victoria New- market Gaslight and Coke Company, Limited, are prepared to receive TENDERS for the necessary IRONWORK for mounting 24 Oval Retorts complete, delivered free at Newmarket Station.

Tenders to be sent to the undersigned, on or before the 6th of May next, from whom all particulars may be obtained.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
J. H. TROUGHTON,
Manager and Secretary.

Gas-Works, Newmarket,
April 16, 1891.

TAR AND AMMONIACAL LIQUOR.

THE Lymm Local Board are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR (the latter at 4°, 4½°, 5°, 5½°, and 6° by Twaddel's hydrometer respectively) made at their Gas-Works, for a term of One year from the 1st day of July, 1891.

Tar and liquor will be delivered free in Contractor's boat on the Bridgewater Canal.

Tenders to be sent to the undersigned on or before the 2nd day of May, 1891, endorsed "Tar and Ammoniacal Liquor."

The purchaser will have to enter into a contract, form of which can be seen at the Board's Office any Tuesday or Friday, between the hours of Ten and Twelve a.m. and Two and Five p.m.

The Board do not bind themselves to accept the highest or any tender.

Further particulars may be had of Mr. William Severs, Gas Manager.

WILLIAM MULLARD,
Clerk to the Board.

Local Board Offices, Lymm,
April 17, 1891.

COAL AND CANNEL.

THE Lymm Local Board are prepared to receive TENDERS for the supply of GAS COAL and CANNEL, to be delivered at their Gas-Works, in Lymm, for a term of One year from the 1st day of July, 1891. The probable quantities are about 1000 tons of Gas Coal and 100 tons of Cannel (which must be well screened, and as free as possible from Bats, Sulphurous Pyrites, or other objectionable matter); but the Board reserve the right of increasing or decreasing the quantity named.

The person whose tender is accepted will be required to enter into a contract, form of which may be seen at the Board Office any Tuesday or Friday, between the hours of Ten and Twelve a.m. and Two and Five p.m.

Tenders, stating price per ton, delivered at the works, to be sent to the undersigned on or before the 2nd day of May, 1891, endorsed "Coal and Cannel."

Further particulars may be had of Mr. William Severs, Gas Manager.

The Board do not bind themselves to accept the lowest or any tender.

WILLIAM MULLARD,
Clerk to the Board.

Local Board Offices, Lymm,
April 17, 1891.

BOROUGH OF BURTON-UPON-TRENT.

IRONWORK FOR NEW RETORT-HOUSE.
CONTRACT No. 9.

THE Mayor, Aldermen, and Burgesses of the Borough of Burton-upon-Trent, acting by the Council, invite TENDERS from competent persons for the supply, construction, erection, and fixing of a new RETORT-HOUSE IRON ROOF and other IRONWORK for three Benches of Retorts, &c., at the Gas-Works in the said Borough, and the execution of Works incidental thereto respectively.

Full particulars, and copies of conditions, specification, and bill of quantities, with form of tender, may be obtained and the drawings, viewed on payment of two pounds (which will be returned on receipt of a *bond-fide* tender), on application to the Gas Engineer, Mr. F. L. Ramsden, Gas-Works, Burton-upon-Trent.

Sealed tenders, endorsed "Tender for Ironwork," are to be delivered to me at or before Ten a.m., on Saturday, the 2nd of May next.

The Council do not bind themselves to accept the lowest or any tender, nor will they pay any expense or charge relating to the making or delivery of the same.

T. N. WHITEHEAD,
Town Clerk.

Burton-upon-Trent,
April 16, 1891.

BOROUGH OF CLITHEROE.

THE Corporation of Clitheroe invite TENDERS for the RE-SHEETING of the OUTER LIFT of their No. 1. TELESCOPIC GAS-HOLDER at the Gas-Works, Clitheroe.

Further particulars can be obtained on application to Mr. William Miles, Manager, Gas-Works, Clitheroe.

Sealed tenders to be sent to me on or before the 1st of May next.

The lowest or any tender not necessarily accepted.

By order,
JOHN EASTHAM,
Town Clerk.

Clitheroe, April 17, 1891.

ABERDARE GAS COMPANY.

THE Directors of the above Company are prepared to receive TENDERS for 12-inch, 14-inch, and 16-inch CAST-IRON PIPES, 9 feet long each; about 15:0 yards in the aggregate.

Specification and form of tender may be obtained from the Manager.

Tenders, addressed to the Chairman, to be delivered at this Office not later than Twelve o'clock on Wednesday, the 29th inst.

The Directors do not bind themselves to accept the lowest or any tender.

EVAN JONES,
Manager and Secretary.

Gas Office, Aberdare,
April 15, 1891.

BUXTON LOCAL BOARD.

CONTRACT FOR CANNEL.

THE Gas Committee invite Tenders for the supply of good CANNEL for One, Two, or Three years, at the rate of about 3800 tons per annum, to be delivered at their Siding (on the Midland Railway) in Ashwood Dale, Buxton.

Tenders, endorsed "Tender for Cannel," and addressed to the Chairman of the Gas Committee, to be delivered at the Town Hall, not later than Noon, on the 2nd of May.

Forms of tender and other particulars may be obtained of Mr. Geo. Smedley, Gas Department, Town Hall, Buxton.

The Board do not bind themselves to accept the lowest or any tender.

By order,
JOSIAH TAYLOR,
Clerk to the Board.

Buxton, April 11, 1891.

CONTRACT FOR TAR AND LIQUOR.

THE Buxton Local Board invite Tenders for the purchase of the TAR and AMMONIACAL LIQUOR produced at their Works in Ashwood Dale during One or more years.

Particulars to be obtained of Mr. Geo. Smedley, Gas Department, Town Hall, Buxton.

The Board do not guarantee to accept the highest or any tender.

Tenders, endorsed "Tender for Tar, &c.," to be addressed to the Chairman of the Gas Committee, and sent in not later than the 2nd of May.

By order,
JOSIAH TAYLOR,
Clerk to the Board.

Buxton, April 11, 1891.

CONTRACT FOR COAL AND LIME.

THE Inverness Gas Commissioners are prepared to receive OFFERS for 5000 tons of GAS COAL, to be delivered during the next Twelve months at such times and in such quantities as may be required.

Intending offerers to state their price delivered by sailing vessels at Inverness Harbour, also in trucks at Inverness Station.

The Commissioners will also receive OFFERS for about 300 tons of SHELL LIME, delivered as required at Inverness Station or Harbour.

Sealed tenders, endorsed "Tender for Coal" or "Lime," and addressed to Mr. Kenneth MacDonald, Clerk to the Commissioners, will be received up to Monday, the 4th of May.

Gas Office, Inverness,
April 14, 1891.

ROMFORD GAS AND COKE COMPANY LIMITED.

THE Directors invite Tenders for building a new RETORT-HOUSE and COAL-STORE, 175 ft. long by 40 ft. wide inside walls, with Iron Roof and Elevated Railway as under:

Contract No. 1—Brick and Concrete Work for Building.

Contract No. 2—Iron-Framed Roof covered with Corrugated Iron.

Contract No. 3—Column and Girder Work for Railway.

Plans may be seen, and specifications obtained, on application to the Manager, on payment of One Guinea, which will be returned on receipt of a *bond fide* tender, addressed to the Chairman, on or before Twelve Noon on Monday, May 11, 1891.

W. D. CHILD,
Engineer and Manager.

Gas-Works, South Street, Romford.

BELPER GAS AND COKE COMPANY.

TENDERS FOR COAL.

THE Directors are prepared to receive TENDERS for the supply at their Works, situated near the Railway Station, Belper, of 2000 tons, more or less, of GAS COAL (part in the Gas Company's own wagons); also about 200 tons, more or less, of CANNEL COAL, to be delivered at such times, and in such quantities, as the Directors or their authorized Servants shall from time to time order.

Sealed tenders, stating price per ton of 21 cwt., and information as to the quality and quantity of Gas the Coal is estimated to produce, also as to where the same is now in use, to be sent to the undersigned, on or before Friday, the 8th of May.

The Directors do not bind themselves to accept the lowest or any tender, nor to take the whole of the above quantities of coal or cannel.

By order,
JOSEPH PYM,
Managing-Director.

Belper, April 16, 1891.

LUDLOW UNION GAS COMPANY.

THIS Company is prepared to receive TENDERS for the supply during the months of April, May, and June, 1891, of 200 tons of best screened GAS COAL in quantities to suit the requirements of the Company.

Tenders to be forwarded to J. W. MONTFORD, Secretary and Treasurer, Gas Company, Ludlow, SALOP.

HULL GASLIGHT COMPANY.

TENDERS FOR TAR.

THE Kingston-upon-Hull Gaslight Com- pany invite TENDERS for the surplus TAR for One year, the same to be sent in to the Chairman of the Company on or before the 25th of April, 1891.

Particulars may be obtained from

THOMAS BULL, Engineer and Manager.

Gas-Works, Broadly Street, Hull.

BRIERLEY HILL DISTRICT GASLIGHT COMPANY.

THE Directors of this Company invite TENDERS for the supply of 7000 tons (2240 lbs. to the ton) of GAS COAL for the year ending June 30, 1892, to be delivered in quantities as required to Brettell Lane Station and Round Oak Siding, G.W.R.

Tenders to be sent in, endorsed "Tender for Coal," not later than Saturday, May 2 next.

The Directors do not bind themselves to accept the lowest or any tender.

HENRY M. JACKSON,
Secretary.

Board-Room, Gas-Works,
Brierley Hill, April 18, 1891.

BOROUGH OF OLDHAM.

THE Gas-Works Committee invite TENDERS for the TAR and AMMONIACAL LIQUOR to be produced at their different Gas Stations for a period of One or more years, commencing the 1st of July next.

The yearly make of tar is about 6200 tons; and of ammoniacal liquor, about 2,400,000 gallons.

Particulars and forms of tender can be obtained on application to Mr. Herbert Andrew, Gas and Water Offices, Oldham, to whom tenders are to be sent on or before Tuesday, May 5, 1891.

A. NICHOLSON,
Town Clerk.

Oldham, April 18, 1891.

CORPORATION OF BURNLEY.

THE Gas Committee of the above Corporation invite TENDERS for the purchase of the TAR produced at their Works for a term of Three or Five years next ensuing.

The approximate quantity of tar will be 3000 tons per annum.

The tar will be delivered into the Contractor's boats at the Gas-Works Wharf on the Leeds and Liverpool Canal.

Tenders, under seal, endorsed "Tender for Tar," stating price per ton, to be addressed to the Chairman of the Gas Committee, and delivered at the Town Clerk's Office, Town Hall, Burnley, on or before Wednesday, the 29th inst.

ROBERT E. FOX,
Town Clerk.

BROADSTAIRS WATER-WORKS COMPANY.

THE Directors invite Tenders for COVERING IN THEIR RESERVOIR at Broadstairs with an Iron Cover, in accordance with drawings and a specification now to be seen at the Offices of Messrs. Hinds and Son, Queen Street, Ramsgate, where sealed tenders, endorsed "Tank," will be received till Six o'clock in the afternoon of Monday, the 27th day of April inst.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
T. BARWICK,
Secretary.

Broadstairs, April 16, 1891.

THE Gas Committee of the Leeds Corporation are prepared to receive TENDERS for the supply of about 60,000 tons of CANNEL, and about 180,000 tons of best GAS COALS (screened or nuts).

Price per ton to be quoted, delivered at their Gas-Works, Meadow Lane (Hunslet Lane Siding), New Wortley (Gelderd Junction Siding), or at the Gas-Works, York Street, in such quantities as may be required. The contract to commence the 1st of July next, and terminate June 30, 1892.

Forms of tender may be obtained on application to Mr. Lupton, Gas Department, Municipal Offices, Calverley Street.

Tenders may be for any portion of the total quantity required, and will be received not later than Wednesday, the 20th of May next, addressed to the Chairman of the Gas Committee, Municipal Offices, Calverley Street, and endorsed "Tender for Coal."

The lowest or any tender will not necessarily be accepted.

BOLTON CORPORATION GAS DEPARTMENT.

TENDERS FOR TAR.

THE Bolton Corporation Gas Depart- ment are prepared to receive TENDERS for the purchase of TAR, to be produced at their Gas-Works, for the periods of One, Two, or Three years, dating from the 17th of May next.

Approximate quantity, about 4000 tons yearly.

The tar will be delivered into Contractor's tanks at the Craddock Lane and Bullfield Sidings on the Lancashire and Yorkshire Railway, Bolton.

Tenders, under seal, endorsed "Tender for Tar," and stating price per ton of 2240 lbs. and terms, to be addressed to the Chairman of the Gas Department, and delivered at the Gas Offices, Bolton, on or before Wednesday, the 29th inst.

The highest or any tender not necessarily accepted.

By order,
R. G. HINNELL,
Town Clerk.

Town Hall, Bolton,
April 18, 1891.

TENDERS required immediately for adding a SECOND LIFT to a 50-feet GAS-HOLDER; also for HYDRAULIC MAIN and FITTINGS for two Beds of five Retorts.

Tenders to be addressed to Mr. WEST, Gas-Works, ABERAVON.

BRIERLEY HILL DISTRICT GASLIGHT COMPANY.

TENDERS FOR GASHOLDER.

THE Directors of the above Company are prepared to receive TENDERS for adding a SECOND LIFT to their No. 3 GASHOLDER, which is about 70 feet diameter.

Drawing and specification can be seen on application to me at these Works.

Tenders to be sent in, addressed to me, not later than Twelve o'clock (noon) on Saturday, the 25th of April next, endorsed "Tender for Gasholder."

The Directors do not bind themselves to accept the lowest or any tender.

HENRY M. JACKSON,
Secretary.

Board-Room, Gas-Works,
Brierley Hill, April 6, 1891.

TENDERS FOR GAS COAL.

THE Directors of the Chertsey Gas Company invite TENDERS for the supply of 2500 tons of BEST DURHAM GAS COAL delivered free to Chertsey Station during the next Twelve months.

Deliveries to commence on the 20th of May next, and at such times and in such quantities as the Manager may direct.

Tenders, with analysis of the Coal to be supplied, to be sent to the Directors, endorsed "Tender for Coal," on or before the 30th inst.

By order,
JOHN MOIR,
Secretary.

Chertsey, April 11, 1891.

TENDERS FOR TAR AND LIQUOR.

THE Directors of the Wirksworth Gaslight and Coke Company, Limited, invite TENDERS for their surplus TAR and LIQUOR for One year, from the 1st day of May, 1891.

Delivery on Midland Railway filled into purchaser's tanks.

Payments, cash monthly.

Sealed tenders, addressed to the Chairman, and endorsed "Tender for Tar and Liquor," will be received on or before the 25th day of April, 1891.

The Directors do not bind themselves to accept the highest or any tender.

Particulars may be had from

B. S. JONES,
Manager and Secretary.

LYTHAM IMPROVEMENT COMMISSIONERS.

THE Gas Committee of this Board invite TENDERS for the supply of 1500 tons (more or less) of best screened GAS COAL, also 700 tons (more or less) of best screened CANNEL, and 800 tons (more or less) of washed and screened CANNEL NUTS, per year for One or Three years ending the 31st of May, in such quantities as may be required.

Forms of tender may be had upon enclosing *stamped* and *addressed* envelope to the Manager.

No tender will be accepted unless on the prescribed form.

Tenders, with analysis, fully endorsed, and addressed to the Chairman of the Gas Committee, to be delivered to the undersigned before Twelve o'clock noon on the 30th inst.

The Committee reserve the right to accept the whole or any portion of the quantities required, and do not bind themselves to accept the lowest or any tender.

CHAS. A. MYERS,
Manager.

Lytham, April 10, 1891.

TO COAL AND CANNEL OWNERS.

THE Directors of The Gaslight and Coke Company are prepared to receive TENDERS for supplies of COAL and CANNEL for One year from the 1st of July next, in accordance with the terms of their Specifications.

The Company's requirements for the above period will be—

For Coal	1,750,000 tons.
For Cannel	50,000 "

Deliveries can be made either by Ship in the Thames or by the principal lines of Railway which are in connection with the several Works of the Company.

Copies of the specifications and forms of tender can be obtained upon application at this Office; and all tenders must be sent in before noon on Thursday, the 30th inst., addressed to me, and endorsed "Coal Tender."

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., April 7, 1891.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY.

GASHOLDER TANK.

THE Directors of the Newcastle-upon-Tyne and Gateshead Gas Company are ready to receive TENDERS for the construction of a GAS-HOLDER TANK, 183 ft. 10 in. diameter, and 44 ft. 3 in. deep, at their Redheugh Works.

Plans may be seen on application to the Secretary, at the Company's Offices, Grainger Street West, Newcastle-upon-Tyne; and specifications, with quantities attached, may be had on payment of 10s. for each copy.

Tenders, addressed to the Chairman, to be delivered at the Offices of the Company, not later than Tuesday, the 5th day of May, 1891.

The Directors do not bind themselves to accept the lowest or any tender.

By order,
WM. HARDIE,
Secretary.

Gas Office, Newcastle-upon-Tyne,
April 9, 1891.

COUNTY BOROUGH OF STOCKPORT.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for

1.—An Extension of the present Retort-House at their Portwood Works, 68 ft. by 64 ft.

2.—The supplying and fixing of a Wrought-Iron Roof and Smoke Shaft for same.

Drawings and specifications may be seen, and all information obtained, on application to the Engineer, Mr. S. Meunier, Millgate Works, Stockport, on or after the 23rd inst.

Sealed tenders, addressed to the Chairman of the Gas Committee, and endorsed "Tender for Extension of Retort-House," and "Tender for Roof of Retort-House," to be sent in on or before the 30th inst.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
WALTER HYDE,
Town Clerk.

Stockport, April 18, 1891.

TO TAR DISTILLERS, MANUFACTURING CHEMISTS, AND OTHERS.

THE Directors of the Rochester, Chat-ham, and Strood Gaslight Company are prepared to receive TENDERS for the purchase of the surplus TAR and AMMONIACAL LIQUOR produced at their Works at Rochester and Gillingham for One year, commencing the 1st of July next.

In 1890, the quantity of Tar was about 300,000 gallons; of Liquor, about 800,000 gallons.

Further particulars may be had on application at the Office of the Company, 58, High Street, Rochester.

Tenders may be for tar or liquor separately or together, and are to be delivered at the Office, marked "Tender for Tar" or "Liquor," not later than Noon of Thursday, the 7th of May.

The Directors do not bind themselves to accept the highest or any tender; and security for due fulfilment of the contract must be given if required.

WILLIAM SYMS,
Secretary and Manager.

Gas Office, 58, High Street, Rochester,
April 9, 1891.

TENDERS FOR LIGHTING BY GAS THE CITY OF PERNAMBUCO, UNITED STATES OF BRAZIL.

NOTICE is hereby given, that Tenders for the above service will be received, on or before the 18th of May next, at the Offices of the Secretary to the Governor of the State of Pernambuco (Secretaria do Governo do Estado de Pernambuco).

A copy of particulars published by order of His Excellency the Governor of the said State can be had on application to the BRAZILIAN LEGATION, 35, Piccadilly, LONDON; or to the BRAZILIAN CONSUL-GENERAL, 6, Great Winchester Street, LONDON, E.C.

TENDERS FOR LIGHTING BY GAS THE CITY OF PERNAMBUCO, UNITED STATES OF BRAZIL.

REFERRING to advertisement under the above heading which appeared in the JOURNAL OF GAS LIGHTING of the 7th inst., calling for tenders for lighting the above-named City, under provisions of Contract to be obtained from the Brazilian Legation in London, the Proprietors of the Existing undertaking HEREBY GIVE NOTICE THAT THEY CANNOT RECEIVE THE AMOUNT NAMED IN THOSE PROVISIONS OF TENDER AS THE VALUE OF THEIR UNDERTAKING for the following reasons:—

1st Because the valuation upon which the amount named is based was not made in accordance with the conditions of the existing Contract.

2nd. Because the amount named does not represent the value of the property.

3rd. Because the amount named does not represent even the value as estimated by the Arbitrator, against whose appointment and award they have constantly protested, but a much inferior sum.

The said award of the 18th of March, 1889, expressly declares that the prices named were calculated at the Exchange of 27d. per milreis; and the existing Contract specifically declares that the standard of payment shall be in gold which is equal to 27d. per milreis. But the provisions referred to in the advertisement above named contain no stipulation to this effect, but simply give the amount to be paid in milreis, which, at the present time, are worth in currency under 18d. each.

For these and other reasons the present concessionaires have protested against the so-called valuation in legal form, and will at the proper time take such steps as may be necessary to maintain their rights.

April 10, 1891.

LEAFLETS for Distribution by Gas Companies and Corporation Gas Committees:—

OIL OR GAS FOR LIGHTING OUR HOMES? Price (delivered free) 5s. per 100; £2 per 1000. Larger quantities by agreement. Specimen copy, by post, 1½d.

THE COMPOSITION AND USE OF GAS LIME IN AGRICULTURE. By (the late) Dr. A. VOELCKER, Professor of Chemistry to the Royal Agricultural Society of England. Price 5s. per 100, post free.

THE VALUE OF SULPHATE OF AMMONIA AS A MANURE. By F. J. LLOYD, F.C.S., Consulting Chemist to the British Dairy Farmers Association, Lecturer on Agriculture at King's College, &c. Price 5s. per 100, post free.

THE USE OF SULPHATE OF AMMONIA AS A MANURE. By WILLIAM ARNOLD, Chairman of the Tamworth Gas Company. Price 2s. 6d. per 100, post free.

Published by WALTER KING, 11, Bolt Court, Fleet Street, LONDON, E.C.

THE Banbridge Gas Company invite TENDERS for 500 to 900 tons of best screened GAS COAL, to be delivered free on waggons at Warrenpoint.

Tenders and analysis to be with me on or before the 27th of April.

S. HILL,
Secretary.

Banbridge, Ireland,
April 15, 1891.

CORPORATION OF NEWCASTLE-UNDER-LYME.

EXHIBITION OF

GAS-STOVES, GAS-ENGINES, FITTINGS, &c.,

MAY 4 AND FIVE FOLLOWING DAYS,

AT THE

NEW MUNICIPAL HALL.

THE Gas Committee of the above Cor-poration invite APPLICATIONS FOR SPACE from Persons desirous of Exhibiting GAS-ENGINES, GAS-FIRES, FITTINGS, GLOBES, GAS COOKING-STOVES, AND OTHER APPLIANCES at the above Exhibition.

Application, giving space desired, to be made to the undersigned, not later than the 24th of April next.

W. WINSTANLEY,
Manager and Secretary.

Gas-Works, Newcastle-under-Lyme,
Staffs., April 8, 1891.

RE **G. KENT ESQ., DECEASED, AND OTHERS.**

GAS, WATER, AND OTHER SHARES.

MR. ALFRED RICHARDS is instructed to SELL BY AUCTION at the Mart, Tokenhouse Yard, E.C., on Thursday, April 30, 1891, at One o'clock punctually, in lots, 620 ORIGINAL SHARES and a quantity of STOCK in the following Companies:—

Romford Gas Company.
Brighton and Hove Gas Company.
Grays Gas Company.
West Ham Gas Company.
Tottenham and Edmonton Gas Company.
Harrow Gas Company.
Woking Gas and Water Company.
Albo-Carbon Light Company, Limited.
Lea Bridge, Walthamstow, and Leyton Tramways Company.

Particulars of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Price 2s. 6d., in Foscap broadside stiff paper covers.

PLANS AND LETTERPRESS DESCRIPTION OF THE

SYDNEY GASHOLDER.

Reprinted from the JOURNAL, Vols. LII. and LIII.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

Eighth Year. Demy 8vo., Price 5s. 6d. post free.

THE COMPLETE REPORTS

OF THE PROCEEDINGS OF THE VARIOUS

DISTRICT ASSOCIATIONS of GAS MANAGERS FOR 1890.

Forming a Companion Volume to the Transactions of The Gas Institute, with which it is uniform in size.

***The Volumes for 1883 to 1889 are still on sale.

LONDON:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

CANNEL
LARGE AND WELL SCREENED.
10,000 Tons
Put on Rail at 5s. 6d. per ton.

Yield of gas per ton	8200 feet.
Illuminating power . .	20·50 sperm candles.
Ammoniacal liquor per ton	120 lbs.
Tar per ton	60 lbs.

A trial order for not less than ten Wagons from any Corporation or Gas Company before purchasing the lot will be accepted at the above price.

Apply to THOMAS FEATHER,
Colliery Agent & Coal & Cannel Merchant,
MIRFIELD, *via* NORMANTON.

ESTABLISHED 1872.

G. Coombe Stuart, F.C.S.

33, ELMFOOT STREET,
OFF RUTHENGLEN ROAD, S.S.,
GLASGOW.

PUBLIC ANALYST,

Consulting Chemist,
GAS EXAMINER, AND ASSAYER.
FEES MODERATE.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

Patents procured for Foreign Countries.

Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

HEBBURN MAIN GAS COALS.

Produce of Gas per ton - - - - - - - 10,500 feet.
" Coke " - - - - - - - 13½ cwt.
Illuminating Power - - - - - - - 16 candles.

For Prices, f. o. b. Ship or delivered, apply to

W. RICHARDSON,

Hebburn Colliery Offices, NEWCASTLE-on-TYNE.

JAMES NEWTON & SONS,

(Established 1820)

FIRE-BRICK AND TILE MERCHANTS,

Wholesale and for Exportation,

FALCON DOCK, 78 AND 79, BANKSIDE,

SOUTHWARK, LONDON, S.E.

DEPÔT for STOURBRIDGE AND NEWCASTLE FIRE-BRICKS, LUMPS, TILES and FIRE-CLAY, and every Article suitable for

GAS AND WATER WORKS.

PATENTS FOR INVENTIONS,

REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.

SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*

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Special experience in Gas and Ammonia Plant.

JAMES OAKES & Co.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road,

CITY ROAD, LONDON, N.

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

HOLMSIDE GAS COALS.

(Wrought out of Holmside and South Moor Collieries.)

PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16¼ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, L'Union des Gaz, and by many other Gas Companies both at Home and Abroad.

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-ON-TYNE.

PRICE'S PATENT COKE & COAL BARROW

effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

FIRE-BRICKS. ✣ ✣ FIRE-CLAY.

JAMES WHITE & Co., Limited,

Albert Oil-Works,

WIDNES, LANCASHIRE.

Sole Proprietors of the Largest and Purest Beds of Fire-Clay in England.

FOR GAS FURNACES our GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the market.

GANNISTER and SILICA FIRE-CLAY guaranteed of the Purest and Finest Quality.

ANALYSIS AND REFERENCES ON APPLICATION.

TROTTER, HAINES, & CORBETT,

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FIRE-CLAY & BRICK WORKS,

STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.

Proprietors of

BEST GLASSHOUSE POT & CRUCIBLE CLAY.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.

MIRFIELD, NORMANTON.

SOOTHILL WOOD CANNEL.

Yield of Gas per Ton, over 12,000 Cubic Feet.
Illuminating Power - - - - - 26 Candles.
Coke per Ton, - - - - - - - 57 per cent. of a quality almost equal to that made from the best Coking Coal.

For Analysis and Price, apply to

The Soothill Wood Colliery Co., Ld.,

SOOTHILL WOOD COLLIERY,

BATLEY, YORKSHIRE.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

G. WALLER & CO.'S "PHŒNIX WASHER"

The Divisions in the Revolving Discs are filled with

"WOODEN CLUSTERS"

(As patented by them in 1883).

Also tubes for raising and distributing Liquor over the Clusters.

Efficient in action and small driving power.

Patent four-blade exhausters to pass from 50,000 to 500,000 feet per hour.

Patent three-blade exhausters to pass from 5000 to 40,000 feet per hour.

EXISTING EXHAUSTERS ALTERED TO PASS AN INCREASE OF 30 TO 50 PER CENT.

Using the same Valves, Connections, and Driving Power.

FRICTION 25 PER CENT. LESS THAN OTHER EXHAUSTERS.

THE DELIVERY OF GAS BEING MORE DIVIDED EACH REVOLUTION, THE GAUGE IS MORE STEADY.

Model of Four or Three Blade Exhauster on application.

BEALE EXHAUSTERS FOR 300 WORKS.

PARK STREET, SOUTHWARK, LONDON, S.E.,

AND AT STROUD, GLOUCESTERSHIRE.

THOMAS ILLINGWORTH,
NORTH DEAN CHEMICAL WORKS,
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.
TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery

NEWBATTLE CANNEL.
QUOTATIONS ON APPLICATION TO
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LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

THOMAS TURTON
AND SONS, LIMITED,
Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
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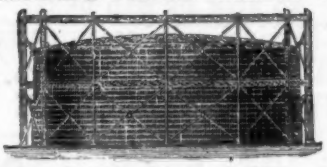

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Special Bricks for Intense Heats.
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The Meter is fitted with the ordinary registering dial, and has in addition a circular one divided showing twelve pence. On each Meter is marked the number of cubic feet it will pass for one shilling; and this can be arranged to cover cost of Meter-Rental, Fitting, and Gas consumed. These Meters are made of the best material and workmanship.

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For Illustrated Description, see Advt. p. 665.

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The centre from which the requisite elasticity is obtained will adapt itself to uneven surfaces to which it may be applied, and allow the expansion and contraction to be fully taken up. The covering being of Asbestos Cloth imparts a protection to the centre, and so prolongs its elasticity. **For Manhole, Mudhole, Steam Pipe, and Mash Tun Door Joints, it is unequalled;** and if applied as directed, **a ring can be used many times over.**

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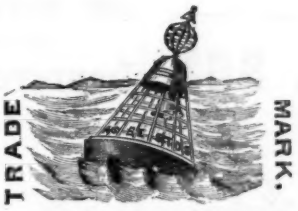

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For Steam-Engines & Cylinders, Gas-Engines, and every class of machinery.

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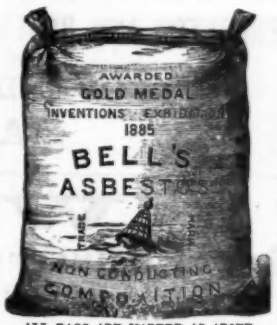
Will reduce loss by radiation and save 40 per cent. of fuel.
Is superior to any other, and saves its cost in a few months.



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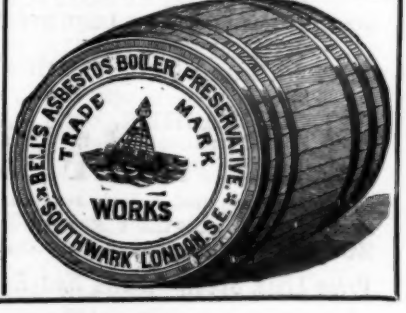

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Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

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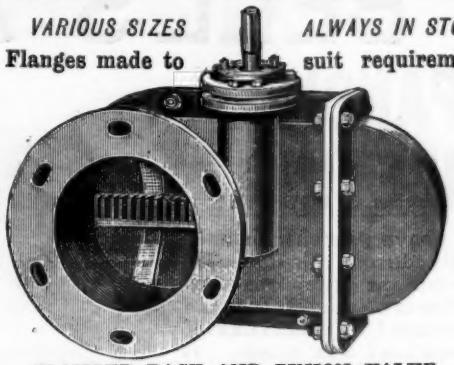

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This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

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PLANS and SPECIFICATIONS furnished for **Extensions** and **Enlargement** of existing **Works,** adapting them to the most **Improved** and **Modern Principle** of **Gas Manufacture.**

PURIFIERS, CONDENSERS, WASHERS, ENGINES and EXHAUSTERS, STATION METERS and GOVERNORS, manufactured and erected.

Makers, by permission of that eminent authority **Mr. GEORGE LIVESEY,** of his **CELEBRATED PATENT WASHER,** highly approved by all the Engineers of Works where adopted. Largely in demand.

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which have acquired a high reputation for the **excellence** of Materials and Workmanship; their **durability** and **accuracy** of **Register** guaranteed. They are used by several of the **London Gas Companies,** and over **200 Provincial Gas Companies.**

Price Lists, Specifications, and Estimates provided for any work appertaining to Gas Lighting, from the Retort-House to the Drawing-Room.

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&c., &c.; ALSO
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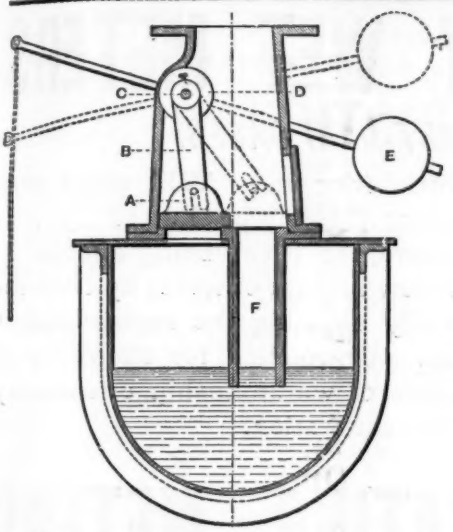

MEIKLEJOHN'S
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IMPROVED SLIDE-VALVE ANTI-DIP

Is perfectly reliable in action, and requires no attention.
Has all the advantages of the Dip and Anti-Dip combined.
Is cheap, and easily fixed to any form of main.
Will save more than their cost in one season's working.

MR. THOS. NEWBIGGING'S REPORT.

5, Norfolk Street, Manchester, Dec. 11, 1889.

SIR,—I have examined your Anti-Dip arrangement, and have seen it at work on the Retort-Benches at the Longwood Gas-Works, and the opinion which I have formed of its simplicity and certainty in working is distinctly favourable; so much so *that I consider it to be, without exception, the most efficient Appliance of the kind which has yet been introduced.* It can be applied to existing Benches with great ease, and at a minimum cost. So far as I am aware, it embodies a principle of action not previously applied in this direction.—Yours truly, THOS. NEWBIGGING.

Further particulars from the Sole Patentee and Manufacturer,

NEILL MEIKLEJOHN,
GAS ENGINEER,
LONGWOOD, HUDDERSFIELD.

*** During the serious illness of Mr. Neill Meiklejohn, all communications as to the above should be addressed to C. Meiklejohn, Gas Engineer, Oldbury, near Birmingham.

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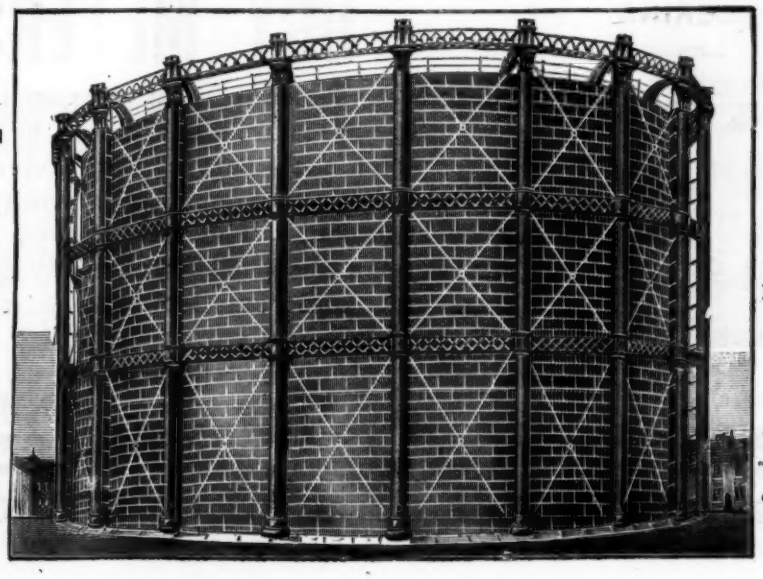

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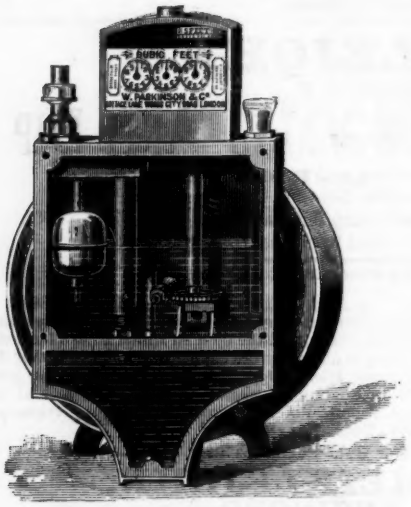
W. PARKINSON & Co.

— ESTABLISHED 1816 —

THE ORIGINAL MANUFACTURERS OF WET METERS.



ORDINARY WET METERS

IN CAST-IRON CASES.

Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.

COMPENSATING METERS

IN TINNED OR CAST-IRON CASES.

The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.

DRY METERS.

These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected, and the brasswork and smaller fittings are of superior workmanship.

COTTAGE LANE WORKS, CITY ROAD,
LONDON.
Telegraphic Address: "INDEX."

BELL BARN ROAD WORKS,
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Telegraphic Address: "GAS-METERS."

OFFICE: 10, MAWSON'S CHAMBERS, DEANSGATE,
MANCHESTER.
Telegraphic Address: "PRECISION."
(See also Advt., p. 734.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, April 21, 1891.